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AN INSIDE LOOK AT THE BEST OF THE BEST

TECH BREAKTHROUGH LATEST IN SERVO CONTROL

WE REVIEW Dazzler—easy fun flyer P-40—Flying Tiger ARF
Viper—electric park flyer Peashooter—Golden Age fighter

AUGUST 2002
USA $4.99 CANADA $7.50
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AirAGE PUBLISHING
www.modelairplanenews.com

MODEL Airplane NEWS

AUGUST 2002 VOLUME 130, NUMBER 8

CONSTRUCTION

FEATURES

ON THE COVER: Tom Wood's F-18C comes in for a landing at Top Gun 2002; insets, left to right: Mike Winter's Tiger Moth on a low flyby and Ian Richardson's/Steve Elias's F-100D on takeoff. THIS PAGE: Nick Ziroli Jr.'s Grumman Avenger on a torpedo run (photos by Debra Sharp and Gerry Yarrish).

COLUMNS

FLIGHT TESTS

DEPARTMENTS

EDITORIAL

BY DEBRA SHARP

Top Gun 2002

BROUGHT TO YOU BY *MODEL AIRPLANE NEWS* AND THE ZAP GANG

With a new venue, new classes of competition and the same high caliber of museum-quality models and expert pilots we've come to expect at **Top Gun**, the world's premier scale invitational was truly impressive, and the *Model Airplane News* crew was again on hand to capture the action on film. Held for the first time at the Lakeland Linder airport in Florida (home of Sun 'n Fun, the Experimental Aircraft Association annual meet), the 14th rendition of Top Gun featured 12 high-speed, turbine-powered jets, 58 civilian and military aircraft and nine helicopters in both static and flight competition. The jet models dominated this year's winners' circle, picking up the top scores in Expert, Designer and Team—every class in which they were entered! Two new competition categories, World (FAI) Class and Helicopter, added even more appeal for scale enthusiasts. Check out the full story on page 26 of this issue. To see and hear these magnificent aircraft in action, see our video Click Trip at modelairplanenews.com.

A team entry by David Matthews and Bill McCallie, this 126-inch-span Mosquito takes a practice taxi run at Top Gun 2002.

JUST A CLICK AWAY

Have you visited our expanded bulletin board at the **radiocontrolzone.com** lately? It's a great place to keep up with what's happening in the world of RC airplanes. Now moderated by longtime *Model Airplane News* contributor Dave Robelen, our RC airplane discussion forums are full of information on building and flying RC models, with special sections devoted to model aerodynamics, sport models, sailplanes, park and backyard flyers and indoor RC, as well as an area to buy and sell RC equipment and planes. If you have questions about anything RC, you'll find answers here.

GREAT RC REDESIGN CONTEST

You can win more than $500 in cash and prizes by sending your entry to our **Great RC Redesign Contest** by September 1, 2002. Any personalized, commercially available ARF model is eligible; just send photos and a 100-word description of your modification(s) to us at 100 East Ridge, Ridgefield, CT 06877-4606 USA or email man@airage.com. Winners will be featured in an upcoming issue of *Model Airplane News*.

MODEL Airplane NEWS

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AirAGE PUBLISHING

MPA Magazine Publishers of America

100 East Ridge, Ridgefield, CT 06877-4606 USA

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PRINTED IN THE USA

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

CHOPPER CONTROL

Great timing on your July 2002 "Almost-Ready-to-Fly Heli Guide"! I've been thinking about getting into helicopters, and the article provided a lot of useful information. I noticed in the chart that it says the Century Helicopter Raven uses CCPM for the control system. What is CCPM in a helicopter? [email]

DAVID NEFF

David, glad to hear you enjoyed the article; thanks for the feedback. CCPM stands for cyclic/collective pitch mixing, and it offers a control system that is more precise, has more power and is less complex than a standard one-servo control system. Just like the one-servo system, CCPM uses three servos for the three main controls: roll, elevator and collective. The lower swashplate on a standard system has four balls that are set 90 degrees apart, and most CCPM systems use three balls set 120 degrees apart.

The difference between standard and CCPM systems is in the way the servos work the swashplate. In a standard system, one servo works one control input; in CCPM, all three servos work together to achieve the same results. For example, if an elevator input is given, all three servos work together to move the swashplate fore and aft. In a standard system, only one servo moves the swashplate fore and aft. With two or more servos working together, servo torque is maximized. CCPM also eliminates the need for complex mechanical mixing, which requires many more parts.

CCPM mixing is achieved through the programming that's in many of today's helicopter radio systems. Though it sounds complex, CCPM is pretty simple to set up. In fact, because CCPM uses so few parts, building and maintaining a CCPM heli has become very easy. Take the heli plunge, David, and have fun! RB

FUELIN' AROUND

I don't know whether you can help, but I am just getting back into the RC hobby and would like to make some fuel. My problem is finding the nitromethane. I used to get it from a speed shop in New Jersey, but I can't seem to find any in the Pennsylvania mountains where I live now. I would like to get at least one gallon, just to add to fuel and test small amounts of home brew. Any information you might have would be great.

Another question: I picked up a case of K&B 100 in gallon cans that still look good.

Do you think the fuel is still usable? Anything I should look for? Thanks! [email]

DON

These days, I get my nitromethane from Klotz Special Formula Products, (800) 242-0489. The Klotz folks sell nitro and other common fuel components via mail order.

If the K&B 100 cans have been tightly sealed, the fuel should be OK. To check it, pour some into a clear glass jar and look at it; it should be a light amber color with no solid flakes in the mix (nothing that looks like crumbled white crackers!). Flakes such as these are castor-oil lubricant that has precipitated from the suspension with the other fuel components. Although not usually a good sign for the fuel's viability (castor often becomes rancid), some experts claim that the flakes will dissolve if you allow the fuel container to sit in the sun for a while.

If the fuel has turned dark brown or viscous (thick), one or more of the ingredients has deteriorated, and the mixture is useless.

DAVE GIERKE

BALANCING ACT

The letter from Bill Trueblood about Gerry Yarrish's "Thinking Big" column on biplanes in the June 2002 "Airwaves" prompted me to send this letter.

About four years ago, I built a WACO model E biplane from an old Sterling kit and installed the recommended engine—a .40 K&B. The kit was originally designed for U-control, but I installed RC instead. The airplane flew very poorly; it was very erratic, and no amount of trimming made it fly with any stability. After three engines and all kinds of changes, I gave up and stowed it in the garage.

After reading the article—especially the reference to determining the CG—I dragged the WACO out and checked its CG in accordance with the article computations and compared it with the plan. I found a difference of 1¼ inches, in a tail-heavy direction! I checked the results a couple of times and found that this new CG was accurate, according to the article.

I installed my O.S. .70S 4-stroke *and* 3½ ounces of lead in the nose to match the CG computed in the article. The results were spectacular! It flew hands-off on the test flight and has become a totally enjoyable airplane to fly. Thanks for the good information.

RICHARD EIMERT
Monsey, NY

Glad to be of help, Richard. CG is something that has always mystified modelers, and you can't always trust what's listed on the plan or in the kit. Having a good formula that you know will work is the best way to make sure that your model is properly balanced. A balanced airplane will fly just great. GY

NEW PRODUCTS OR PEOPLE hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. Every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!

AIR SCOOP

by the Model Airplane News *crew*

WATTAGE

Two Models and a Motor

Another addition to the WattAge lineup of high-performance electric aircraft, this 36-inch-span Giles G202 comes with a Cobalt Speed 400 motor, and it promises terrific aerobatic capabilities. Built up out of balsa and covered in iron-on film, the model comes with the motor and gearbox already installed and with control surfaces already slotted for CA hinges. This little showstopper is a steal at only $150.

Pair the new WattAge Mini Thermalaire with your favorite Speed 400 power system, and you'll be sailing in no time. This 60-inch-span model features a wood fuselage and a foam-core and balsa-sheeted, bolt-on wing, and it's covered in iron-on film. Price: $89.99.

Looking for a high-performance Speed 400-size power system? Check out WattAge's new Super Cobalt; it can handle twice as many watts as a stock Speed 400 motor. Weighing in at 3.5 ounces, this little powerhouse has replaceable brushes and springs for easy maintenance, and it can turn 19,500rpm at 8 volts. Cost is just $39.99.

WattAge; distributed by Global Hobby Distributors (714) 963-0133; globalhobby.com.

MDS

2.18 FS PRO

The folks at MDS are marching boldly toward the future with the introduction of their newest and biggest engine yet—the MDS 2.18 FS Pro. With a completely redesigned carburetor, the 2.18 has the biggest displacement in its class and is capable of providing more than enough power for most 15- to 20-pound IMAA-legal planes. Because the remote needle valve is well behind the prop, tuning the 2.18 is not only easy, but it's safe, too. The new MDS 2.18 FS Pro weighs 48.3 ounces and sells for $219.99.

MDS; distributed by Horizon Hobby (217) 355-9511; horizonhobby.com.

KYOSHO

CALIBER .30 heli

Using the same formula for success as Kyosho's Caliber 60, this new 30-size Caliber ARF is factory built and offered in two versions: with an O.S. .32 SX-H engine or without. Designed as an entry-level heli, the Caliber delivers versatile performance, from easy hovering to exhilarating aerobatics. Just like the 60-size Caliber, the Caliber 30 features a drive system that uses a highly efficient 2-belt drive to smooth out engine vibrations. Both mechanical mixing and 120-degree CCPM mixing are standard, so many types of radios can be used. Other features include a 10mm main shaft and a 6mm spindle shaft for durability and safety, adjustable rotor grips, a tail-boom-mounted rudder servo and a new vibration-damping clutch. The heli weighs about 6.4 pounds and costs $399.99 without an engine; $599.99 with the O.S. .32 SX-H.

Kyosho; distributed by Great Planes Model Distributors (800) 637-7660; greatplanes.com.

CHECKERBOARDAIR

Five Flying Razors

Although only 36 of them were ever built, the Fokker D-VIII has quite a following among scale enthusiasts, and now CheckerboardAir has introduced five new ⅛-scale, electric-powered versions. With laser-cut parts, four-color "lozenge" covering, hardware and vacuum-formed cowl, wheels, twin machine guns and pilot, these planes are easy to build and are recommended for intermediate fliers. Specs: wingspan—42 in.; weight—37 oz.; power—Speed 480; radio—4-channel; price—$140 (plus $8 S&H).

CheckerboardAir (619) 699-0818; checkerboardair.com.

SLIMLINE PRODUCTS

F1 FUELER SYSTEM & SHOWTIME

Formula 1 racecars can be refueled in about 8 seconds; you may not need to fill up quite that fast, but Slimline's F1 Fueler System will speed your time in the pits and make refueling more convenient than you ever thought possible. The idea is simple; an aluminum intake fitting is mounted in your model and is connected to your tank via a length of fuel tubing. A brass fill nozzle—precision-machined to match the intake fitting—connects to your fuel supply. The nozzle is sealed against the fitting with two fuel-safe gaskets, and an audible click lets you know that it's locked in; your hands are then free to work your fuel pump. When your tank is topped off, disengage the nozzle, and snap a gasket-sealed cap into the intake fitting. The F1 system is available for glow or gas, and it comes in four colors.

For those of you who want to show off, check out the Showtime self-contained smoke system. This unit features a programmable flow rate that's controlled by your transmitter. The pump, battery and electronics are an all-in-one unit, and the quick-connect system makes it fast and easy to mount.

Slimline Products (480) 967-5053; slimlineproducts.com.

BBI

BLUE ANGELS PILOT

bbi's ever-growing line of precisely detailed pilot figures takes another giant leap forward with this outstanding, 1/6-scale Blue Angels pilot. Developed with the cooperation and approval of the Blue Angels, this 12-inch figure is the result of exhaustive research to ensure that every detail of the uniform and accessories is faithfully reproduced. The pilot sells for $29.99.

bbi; a division of Blue Box Toys (212) 255-8388; blueboxtoys.com.

ACE SIM RC

JET STREET FIGHTER

In the past several months, there has been a lot of interest and new developments in the park-flyer arena. One of the coolest new foamies is the Jet Street Fighter (JSF) from Ace Sim RC. Though it's only available in plan form right now, kit versions are just over the horizon. This neat delta spans 30 inches and is built of Sturdyboard and carbon-fiber tubes, which makes for a strong and durable wing that's also very light. Power is provided by a typical GWS flight pack. This easy-to-build model uses "tailerons" for elevator and aileron control. Flying characteristics are very stable and quick. The JSF can fly mild aerobatics including extended inverted flight. When a 7-cell, 700mAh NiMH and 2 sub-microservos are used, the model weighs in at 10 ounces for a remarkable wing loading of 5 ounces per square foot. The plan costs $15 and is available in downloadable PDF form from acesim.com.

Ace Sim RC; acesim.com.

NORTHEAST SAILPLANE PRODUCTS

Coronet Acro and Impuls 3D

The folks at Northeast Sailplane Products are hard at work improving their already popular designs. The Coronet Acro now comes with a new wing and ailerons that provide this slow flyer with improved aerobatic abilities while preserving its classic, old-timer charm. This light but strong all-wood model comes completely assembled and covered; simply add some radio gear and a Speed 400 motor, and you're in the air. The Coronet Acro has a 56-inch wingspan and sells for $149.95.

The Impuls 3D also went back to the drawing board, and now it's better than ever. It has larger ailerons for more control at low speeds and a lighter airframe for better vertical maneuvers. The Impuls 3D will easily hover, tail slide and torque roll with the right power system. This 49-inch-wingspan model also comes completely built and covered. It sells for $169.95.

Northeast Sailplane Products (802) 655-7700; nesail.com.

ESPRIT MODEL

DIABOLIC 3D

Esprit Model seems to release a new model every week, so this beautiful new ARF came as no surprise. The 61.5-inch-wingspan Diabolic 3D is sure to grab the attention of even the most seasoned aerobat enthusiasts. The result of many hours of research and flight testing, the Diabolic uses the most modern construction techniques, including CNC milling, carbon-fiber leading edges, double-aluminum wing tubes, a carbon-fiber square joiner rod and an exclusive double-ball-bearing stabilizer tilt mechanism that is sure to redefine 3D flying. The Diabolic comes with a painted fiberglass cowl and wheel pants and a fully illustrated instruction manual. It requires a .40 to .75 glow engine and sells for $339.

Esprit Model (508) 764-4990; espritmodel.com.

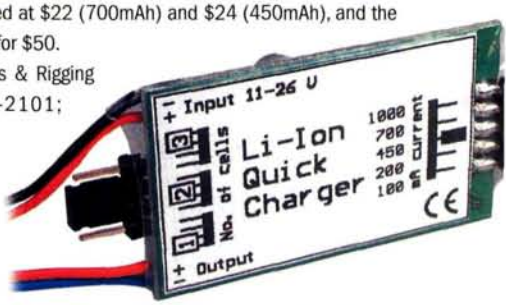
SKY HOOKS & RIGGING

LITHIUM-ION BATTERY & CHARGER

Micro RC modelers are becoming increasingly aware of the many benefits of lithium-ion cells, and as these cells become more popular, suppliers are stepping up to the plate to meet the demand. Sky Hooks & Rigging throws its hat into the lithium-ion ring with the introduction of 2 new cells and a charger. The cells are available in 450 and 700mAh, and each can be cycled approximately 600 times in its life.

The micro-processor-controlled charger was designed to fast-charge 1, 2, or 3 cells. Input and output are protected against short-circuit and polarity reversal. A 12V battery operates the charger, and two LED lights indicate the state of charging. The lithium-ion cells are priced at $22 (700mAh) and $24 (450mAh), and the charger sells for $50.

Sky Hooks & Rigging (905) 257-2101; microrc.com.



SUPER DECATHLON PLAN

Looking for a giant, giant-scale project? Pick up a set of Wendell Hostetler's Plans. Its newest design—the Super Decathlon—is available in 30- and 33-percent scale. That translates to wingspans of 115 and 126¼ inches. When complete, the models can accommodate engines ranging from 50 to 114cc. The plans come on two, well-detailed sheets and include a 4-view drawing. Prices: $43.50 (30 percent); $48.50 (33 percent).

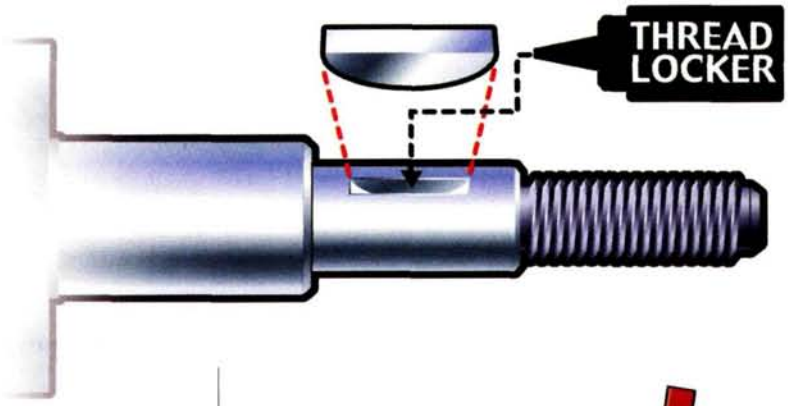
Wendell Hostetler's Plans (330) 682-8896; aero-sports.com/whplans.

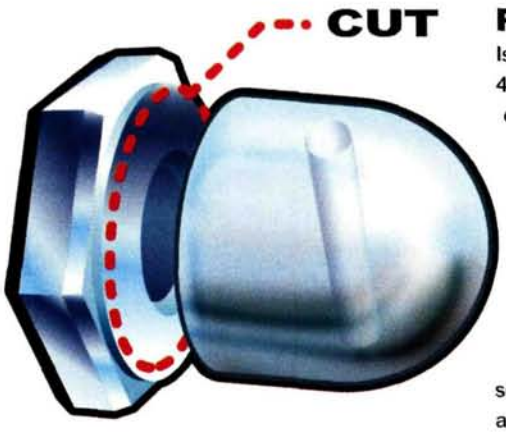
SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

A KEY YOU CAN'T LOSE!

Losing your 4-stroke engine's drive-shaft key can put your airplane out of action in a hurry, but this frustrating situation can be easily avoided with the following technique. With the key removed, use alcohol to clean both the key and the slot in the drive shaft. Coat the inside of the prop driver with light grease or oil to protect it from any over-run. Use a toothpick to apply some medium thread-locking compound to the drive-shaft slot, insert the key, and slide the prop driver into place to align the key in the slot. Let the assembly sit for at least 30 minutes while the thread-lock cures, after which the key will be securely seated. If at some point you need to remove the key, a flat-blade screwdriver or pliers will easily break the thread-lock seal and free the key.

Brian Winch, Lurnea, New South Wales, Australia





TWO-FOR-ONE PROP NUT

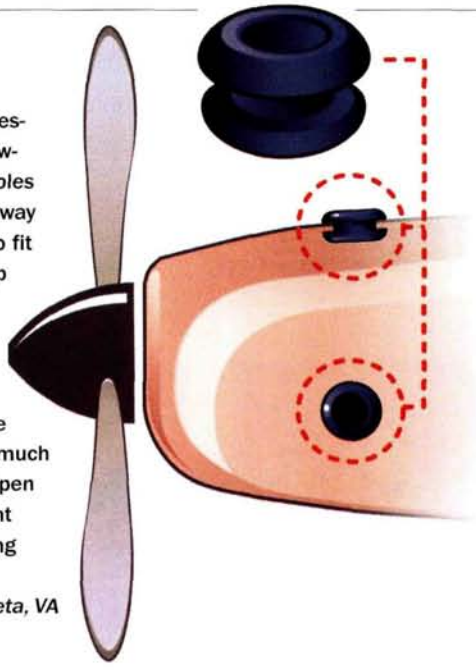
Is a loose prop nut on your favorite 4-stroke driving you crazy? Try this: on a lathe using a parting tool, cut a Harry Higley prop nut into two pieces. Make the cut where the hex-shaped section joins the nut's main body. When the cut is complete, use a wrench to tighten the hex end to use as the prop nut and the nose piece as the jam nut to hold the prop securely in place. You'll never lose another nut again.

Richard Kremer, Vashon, WA

COWL CLEANUP

Cutting holes in a cowl is a necessary evil for most of us, but glow-plug, fuel- and needle-access holes don't have to be ugly. A simple way to clean up these openings is to fit rubber grommets around the lip of each hole. Hardware and electrical supply stores sell these inexpensive grommets in a variety of sizes. When in place, they make access holes in your cowl look much cleaner. They also protect the open edge of the cut and help prevent the cowl and paint from cracking or chipping.

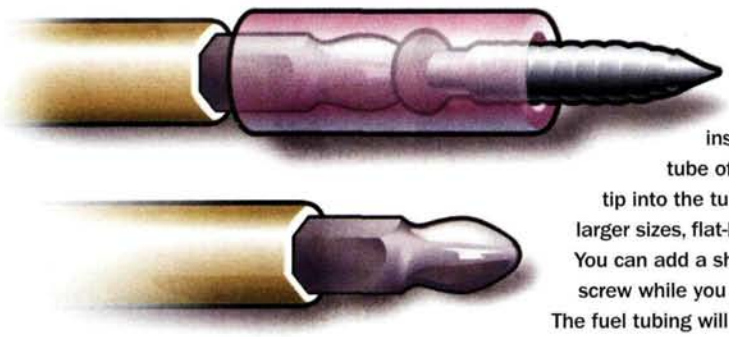
Robert McGuire, Moneta, VA



SERVO BY NUMBERS

Most receivers come with numbered connections, but that doesn't help unless your servo leads are numbered, too. A labeling gun from your local office-supply store can make a neat, simple way to organize your servo connectors. For each of the servo leads, just print out numbers that correspond to the connection on your receiver and then tape the numbers, like little flags, around the loose end of each lead. Now, when you remove your receiver for use in another model, you can quickly and easily drop it back into place without the time-consuming trial and error to get the channels right.

George Poirier, Providence, RI



LONGER DRIVES

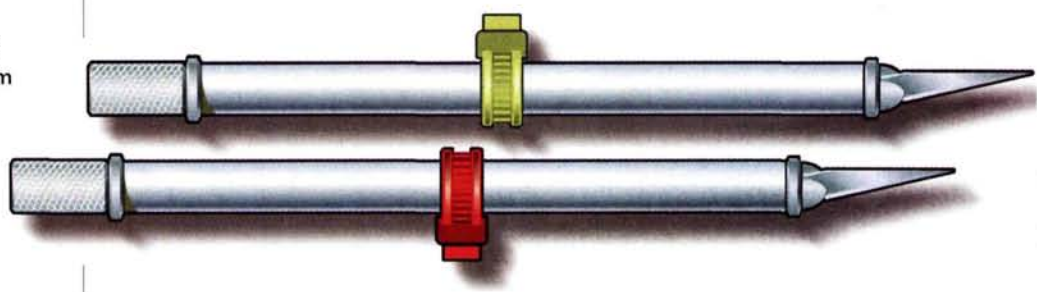
No, we're not talking about car trips or your golf game! This tip shows you how to make your own long-reach, slim-handle screwdriver for accessing those hard-to-reach screws inside your model. Take some 5/16-inch-o.d., 1/32-inch-thick brass tube of a length suitable for your needs and insert a 1/4-inch hex-driver tip into the tube end. A no. 1 Phillips screwdriver tip is the most useful, but larger sizes, flat-blade screwdrivers, hex drivers and Torx tips can all be used. You can add a short length of 1/4-inch-i.d. fuel tubing on the end to hold your screw while you position the driver inside the model, and then drive the screw. The fuel tubing will release the screw as it bites into the model.

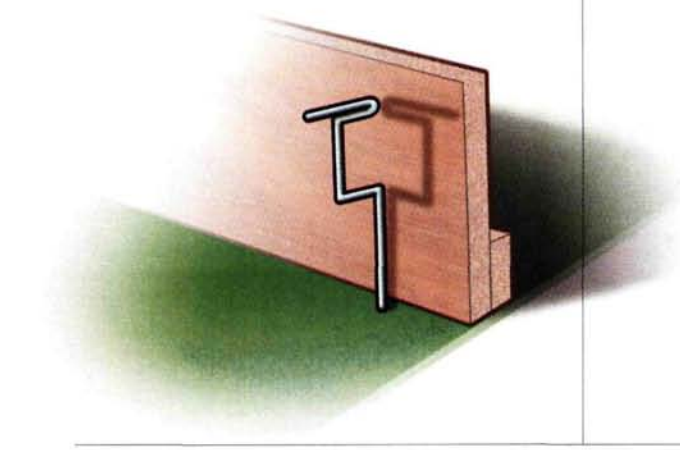
Tom Naser, Meadows Place, TX

FLUSH PIN

If you need to pin something to your building board, but the head of the pin prevents it from fitting tightly against an adjacent surface, try this. With your Z-bend pliers, bend your pin to offset the head. With the pin bent this way, it can be inserted through the wood and straight down into the building board, even if it has to sit flush against a vertical section.

Karl Byman, Longview, WA





SHARP IDEA FOR HOBBY KNIVES

We've all heard the story, and try as you might not to laugh at the hapless victim, sometimes you just can't help it when a fellow modeler reports that his hobby knife rolled off the worktable and found his foot on the way down. With this helpful tip, modelers will never again have to endure this painful mishap or the embarrassment of its retelling. Simply attach a common zip-tie to the handle of your blade, and it will stay safely on your tabletop. While you're at it, if your hobby-knife handles are identical, use different-color zip-ties to designate different degrees of blade sharpness. For example, use a red zip-tie to indicate a new blade for precise trimming and a white zip-tie to indicate a knife with a used blade for general cutting. When the new blade gets a little worn, move it over to the general-use knife.

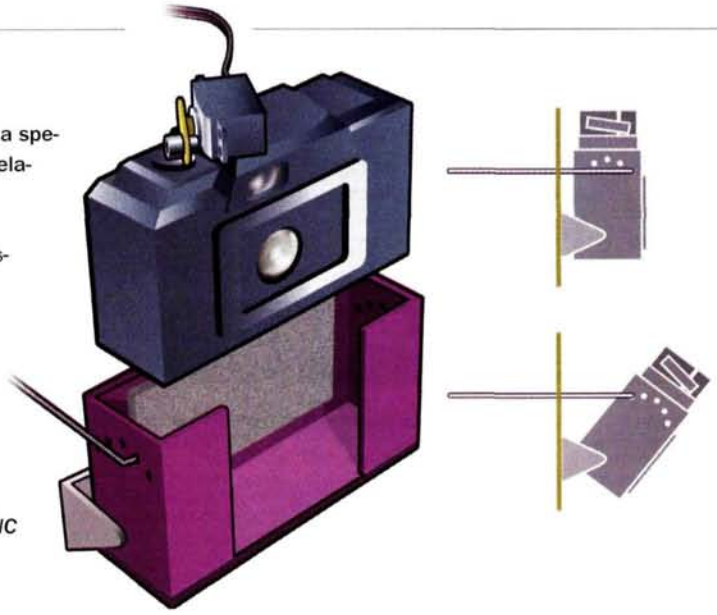
Doug Beaver, Dearborn Heights, MI

EYE IN THE SKY

RC aerial photography has been around for a while, but it often requires a special prefabricated rig or complicated alterations to your plane. Here's a relatively simple way to build a camera box for your .40-size trainer that shouldn't increase its weight by more than a pound.

The box is constructed of balsa and lite-ply: the back and front are 1/16-inch ply, the ends are 1/8-inch ply, and the floor is 1/8-inch balsa. Venetian blind hold-downs allow the camera to rotate, and a servo (epoxied to the camera) is positioned so that the servo arm and brass pushrod connector trigger the shutter button. An inexpensive 35mm camera with automatic film advance works fine for this task. Be sure to check the side-to-side and fore-to-aft center of gravity of the plane with the camera rig in place. To get the balance right, you may have to add some weight to a wing.

Edward Martin, Asheville, NC



PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Mike Mulligan,
Las Vegas, NV
RQ1B PREDATOR
Mike used 3-views from our March 2002 issue and photos taken at Nellis Air Force Base to design and build this 84-inch-span spy plane. Powered by a .46 Royal engine, the 7-pound, 6-ounce Predator has good flight characteristics and looks great in its MonoKote and paint finish. We have one suggestion, Mike: a model this nice deserves to have a digital camera in its nose!

Michael Vollmer,
Mayville, WI
AERONCA CHAMP
Michael built this 105-inch-span model from the Hobby Lobby Precedent kit and painted it using documentation from Richard Charette's full-size Champ. He writes that after several flights and trim adjustments, the Champ flies great on an O.S. .91 4-stroke engine.

Karl Kilpatrick,
Pennsauken, NJ
ME-262 SCHWALBE
This is the second Me-262 that Karl has designed and scratch-built, and he has learned that owing to the model's thin airfoil, flaps are a necessity for takeoffs. This warbird has a 68-inch wingspan and weighs 11.5 pounds with an O.S. Max 1.08 engine and SpringAir retracts. A 6-channel Futaba radio controls the fast-flying model.

Ted Wise,
North Palm Beach, FL
SKEETER BEETER
When he couldn't find an Agplane kit, Ted decided to design and build his own model. This 62-inch-span plane has flaps, a tow release, TME smoke system and a hinged forward turtle deck for access to the inside. With a CS .40 for power, the plane flies realistically and keeps the mosquito population down at Ted's flying field (photo by Nick Spagnuolo).

Norman Wampler,
Tallahassee, FL
NOW THAT'S BIG!
How do you get a 16-foot-span model to the field? You build a special trailer for it! A year and a half in the making, this model is powered by a G-62 gas engine, is covered in 12 rolls of MonoKote and weighs a whopping 38 pounds. Norm and his friends report that it flies beautifully.

Vance Mosher,
Vancouver, WA
HEINKEL HE-111
This 89-inch-span torpedo bomber model is entirely scratch-designed and -built, and it features a paint scheme from the KG 26 operating out of Sardinia in the Mediterranean in 1942. Two SuperTigre .50 engines provide power to the 21-pound, glassed-wood model, which has a relatively low wing loading and is a gentle flyer.

George Wardleigh,
Ogden, UT
LAIRD-TURNER LTR-14 METEOR

Col. Roscoe Turner flew the full-size racer that this model is based on in the 1937 Thompson Trophy Race. George designed and built the 1/3-scale model with functional air scoops and exhaust stacks for the 3W120b2i gas engine; he also added decals that he made on his computer. He writes, "The plane flies well and will do most aerobatics maneuvers."

Giorgio Bassano,
Sarzana, Italy
AIRONE EXPERIMENTAL

Inspired by the Italian Sky Arrow ultralight, Giorgio designed and built this 84-inch-span pusher model to tow other models, and he plans eventually to equip it with a video camera. The SuperTigre .90-powered model has a wood fuselage with a foam wing and tail and is dressed up in automotive paints.

Ramon Torres, Beech T-34C-1

FIRST PLACE WORLD CLASS

Joe Grice/David Shulman, F-100D

FIRST PLACE TEAM

click trip MODELAIRPLANENEWS.COM SEE THESE AIRCRAFT IN ACTION!

FIRST PLACE EXPERT

Joe Rafalowski, T-33

FIRST PLACE DESIGNER—BOB VIOLETT, F-100F

MR. TOP GUN

PHOTOS BY DEBRA SHARP & GERRY YA

MODEL AIRPLANE NEWS AND ZAP PRESENT

TOP G

by Debra Sharp & Gerry Yarrish

For Top Gun participants, 2002 will henceforth be known as the year of change—impressive changes in both location and in the lineup of talented modelers invited to take part in this prestigious competition. The biggest change was the event's relocation from the West Palm Beach polo grounds to the Lakeland Linder regional airport in Lakeland, FL. The home of the famous Experimental Aircraft Association (EAA) Sun 'n Fun aviation extravaganza, Lakeland Linder Airport is a perfect setting for Top Gun scale. Though very well groomed, the grass field at the polo grounds had become inadequate and was no match for the beautiful, 3,000-foot paved runway the airport offers. Actually, the models operated from the taxiway that paralleled runway 9. The grass section next to the taxiway was also used for the vintage tail-dragger models. The ends of the operational area were totally unrestricted, and there wasn't a house, condo, or palm tree to be seen; a Top Gun pilot's dream come true!

Two more important changes in the Top Gun theme were the addition of the Helicopter and World Class flying classes. As promised last year, Top Gun helicopters had their own area, and this entire segment was a complete show in itself with its own judges and flightline.

The newest fixed-wing addition to Top Gun is World Class. Based on the Federation Aeronautique Internationale (FAI) scale modeling rules, this competition has completely different judging criteria for static and flight scoring than the rest of the fixed-wing classes.

EVENT SCHEDULE

Top Gun 2002 started on Tuesday, April 23, with field setup and familiarization flights for all contestants. Registration began on Wednesday, as did static judging for all the classes including Helicopter, World Class, Expert and Designer. On Thursday, Expert and Designer static judging continued, and practice flying began. Rounds one and two of the Helicopter competition also got under way. To speed static judging, there were two judging stations this year—one for Expert and the other for both Team and World Class.

Registration ended at noon on Friday, and round three for helicopters began. Static judging also finished up for Team, Expert and Designer classes. On Saturday, rounds one and two for fixed-wing aircraft (all classes) were flown, as was round four for helicopters. Sunday had rounds three and four for fixed-wing aircraft flown, and the event ended with the final awards presentation at 4:30 p.m. The special achievement awards had been handed out at Saturday night's dinner and awards presentation held at the Four Points Sheraton hotel.

Wayne Siewert/Jim Sandquist, P-47D Thunderbolt, 9th Team

TN 2002

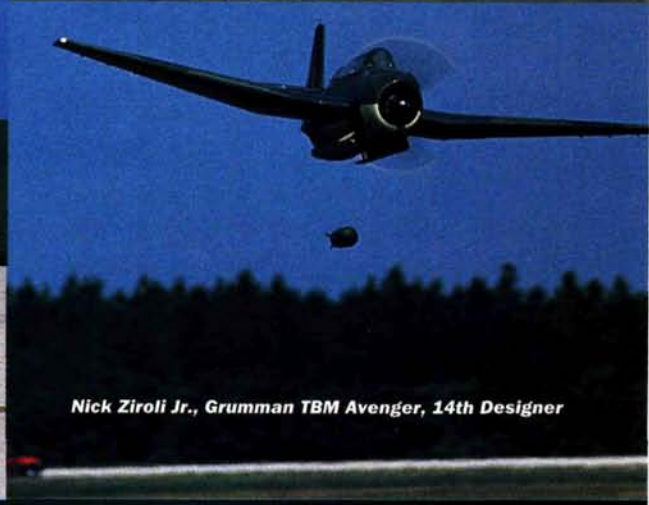
FIRST PLACE HELICOPTER

Russell Matteini, Bell Long Ranger III

Martin Hendrickson, T-34A Mentor, 6th Expert

Kim Foster, DH 94 Moth Minor, 3rd Expert

Pat McCurry, ~~Me-109G-AS~~, 4th Designer



Nick Ziroli Jr., Grumman TBM Avenger, 14th Designer

PILOT	AIRCRAFT	WINGSPAN (in.)	WEIGHT (lb.)	POWER	FUEL	PROP
DESIGNER CLASS						
1. Violett	1/6.8 F-100F Super Sabre	70	36	AMT Olympus	Jet-A	Turbine
2. Foley	1/4.5 BF-109E Messerschmitt	86	25	Moki 1.8	Omega	Moki 18x10
3. Vaillancourt	1/5 Hawker Typhoon	97	47	Quadra 75	Gas	Moki 24x12
4. McCurry	1/4 Me-109G-AS	100	38	3W 70-i	Gas	Moki 24x10
5. Nelson	1/4 WACO YKS-7	93	32	Siedel 7 radial	Red Max	Moki 22x10
6. D. Johnson	1/4 Siemens Schukert	82	16	Brison 2.4	Gas	Homemade 4-blade
7. Roane	3/8 Shoestring Racer	85	22	Saito 1.80	Wildcat	APC 17x8
8. Ziroli Sr.	1/4 Stearman N2S	122	52	G-45	Gas	Moki
9. Platt	1/5 Miles M-20	83	25	Moki 2.1	Wildcat	APC 20x10
10. Koseweski	Fokker D-7	88	34	Q-50	Gas	Zinger 22x8
11. Parenti	1/9 B-25 Mitchell	84	17	Enya .53 4C	Byron	Zinger 12x6
12. Polapink	1/5 Pfalz D IIIA	74	14	O.S. 1.20 4C	Cool Power	Master 16x6
13. Fogarty	1/4 Ercoupe 415D	90	27	Moki 1.8	Wildcat	Moki 18x8
14. Ziroli Jr.	1/6 TBM Avenger	88	32	Robart radial	Wildcat	Moki 26x10
15. Wilkenson	1/6 JU-87B Stuka	91	22	G-38	Gas	Zinger 18x6-10
EXPERT CLASS						
1. Rafalowskl	T-33	85	35	RAM 1000	Jet-A	Turbine
2. Campana	1/5.5 Albatros L-39	84 long	30	RAM 1000	Jet-A	Turbine
3. Foster	1/4 DH 94 Moth Minor	110	16	Laser 1.50 4C	Cool Power	Zinger 18x5
4. Wood	1/7 F-18C	98	46	RAM 750	JP-4	Turbine
5. Weiss	1/6 F-100D Super Sabre	69	33	AMT 280	Jet-A	Turbine
6. Hendrickson	1/4 T-34A Mentor	102	52	Zenoah GT-80	Gas	Bolly 24x10
7. Chevalier	1/3 Piper Tripacer	110	38	ZDZ 60	Gas	Moki 22x10
8. McCaulley	1/6 T-33A	85	28	RAM 750	JP-4	Turbine
9. Mirandes	1/6 P-80 (IOWA)	69	21	RAM 750	JP-4	Turbine
10. Gross	1/4 SE5a	80	22	G-38	Gas	Moki 18x8
11. Denicola	1/5 P-47N	96	41	3W-75	Gas	Moki 24x10
12. Czikk	1/5 P-47D (Razor)	92	35	3W 75	Gas	Moki 26x10
13. A. Johnson	1/5.5 P-36C	82	18	Moki 2.1	Wildcat	Moki 20x10
14. Feroldi	1/3 Fokker Dr.1	94	38	MacMinarelli 85	Gas	Moki 26x10
15. Winter	1/4 Tiger Moth	88	24	G-38	Wildcat	Zinger 18x6
16. Galvez	1/6 Stearman N2S	65	11	Saito .91	Wildcat	Master Airscrew
17. Voglund	1/5 Me-110	118	39	Laser 1.50 4C	Wildcat	Graupner 16x8
18. Rice	1/5.5 KI-61 Tony	86	19	O.S. 1.08	Cool Power	APC 15x6
19. McCallie	1/5 Mosquito	126	54	Brison 3.2	Gas	Zinger 20x10
20. Nitsch	1/7 Rafale	68	45	AMT 180 (2)	Jet-A	Turbine
21. Steffes	1/5 P-47D (Rabbit)	92	38	Sachs 5.8	Gas	Moki 26x10

Static judge Bob Curry checks a model for outline while Craftsmanship judge Rich Uravitch inspects the model more closely.

STATIC AIRPLANE AWARDS

Award	Pilot	Aircraft	Sponsor
World, High Static	Ramon Torres	T-34C	The Zap Gang
Designer, High Static	Jeff Foley	Bf-109	Aerotech
Expert, High Static	Mike Gross	SE5a	Bob Violett Models
Team, High Static	Joe Grice	F-100D	Airtronics
Critics Choice	Joe Grice	F-100D	Airtonics & Van Dell Jewelers
Best Civilian	Charlie Nelson	WACO	*Model Airplane News*
Best Military	Patrick McCurry	Me-109G-AS	American Eagle Aircraft
Best Biplane	Tom Kosewski	Fokker D-VII	RC Report
Best pre-WW II	Mike Gross	SE5a	Glenn Torrance Models
Engineering Excellence	Paul Donofrio	S-39	Robart Mfg.
Best Cockpit Interior	Patrick McCurry	Me-109G-AS	Traplet Publications
Charlie Chambers Craftsmanship	Patrick McCurry	Me-109G-AS	The Zap Gang
Grey Eagle	Dave Platt	—	*Model Airplane News*
Top Buns	Joe Rafalowski	—	Top Gun Hussies

Hosted by the hard-working members of the Imperial Radio Control Club, this year's event went very smoothly indeed. Four flightlines handled the fixed-wing flyers, and separate frequencies were designated for both helicopter and fixed-wing radios. On the flightline, there were no runway or landing conflicts at all; not a single glitch or hiccup! This is a great achievement for a first-time host club. Jim Urick was the club liaison for the event, and the expert way the club handled things made the event run smoothly!

Lloyd Tillman, assistant airport director, was also very helpful in getting things to happen. Lloyd and his assistant, Shelly, had fences removed, buildings relocated and, in general, helped make the entire event a tremendous success. The City of Lakeland's Chamber of Commerce also helped greatly and deserves a note of thanks for providing contacts to get whatever Frank and the Top Gun event needed. Next year, Top Gun will again operate from this wonderful new site. We hear that Frank has some further surprises in store for us, so make sure that you make it down to Lakeland in 2003. With so much of it new and improved, the Top Gun event remains the "must-see" modeling destination! See you there!

RADIO	PLANS/KIT	GEAR MFR.	FINISH	STATIC	FLIGHT	TOTAL
JR	Self (BVM kit)	BVM	Metal Kote	96.25	96.75	193
JR	Self	Platt	K&B epoxy	96.667	93.125	189.792
JR	Self	Likes Line	PPG	94.833	94.25	189.083
JR	Self	Self	Hobby Poxy	95.333	92.042	187.375
Airtronics	Self	—	Stits system	93.917	93.417	187.334
Futaba	Self	—	Dope & fabric	94.917	86.917	181.834
JR	Self	—	Sig dope & Coverite	92	89.292	181.292
Airtronics	Self	Robart	Lacquer	90.25	90.917	181.167
Futaba	Self	—	Hobby Poxy	93.833	80.792	174.625
Futaba	Self	—	GTM lozenge fabric	96.417	77.083	173.5
Airtronics	Self	Robart	0.004 aluminum and Presto	89.333	83.917	173.25
Airtronics	Self	—	Coverite & dope	91.25	37.5	128.75
Futaba	Self	Self	K&B epoxy	90.75	37.208	127.958
Airtronics	Self	Robart	Stits system	95.917	29.042	124.959
Airtronics	Self	—	Latex	89.833	0	89.833
JR	JMP kit	JMP	PPG	94.583	94.75	189.333
Futaba	Jet Tech kit	Jet Tech	PPG	95.167	94.125	189.292
Futaba	Jerry Bates plans	Robart	Lacquer	94.75	93.583	188.333
JR 10X	Yellow Aircraft kit	Yellow Aircraft	PPG automotive	92.583	95.042	187.625
JR	BVM kit	BVM	PPG	91.75	93.708	185.458
JR	Self	Robart	PPG	93.667	91.042	184.709
Futaba	Bill Effinger plan	—	Coverite & dope	93.667	88.958	182.625
JR	Jet Model Products	JMP	PPG automotive	92	89.792	181.792
JR	BVM kit	BVM	PPG	88.25	93.542	181.792
JR	Dennis Bryant plan	—	Auto lacquer	96.5	85	181.5
JR	Ziroli plans/Chuck	Century Jet	Acrylic lacquer	88.167	92	180.167
JR	Vailly Aviation kit	Robart	Acrylic lacquer	90.083	89.458	179.541
JR	Jerry Bates plans	Robart	Hobby Poxy	88.417	86.292	174.709
Futaba	Ron Weis plans	—	Fabric & dope	93.667	75.833	169.5
Futaba	Bud Barkley kit	—	Stits Lite	90.333	73.25	163.583
Futaba	Sterling kit	—	21st Century Products	88.083	65.917	154
JR	Don Smith plans	Century Jet	Hobby Poxy	87.333	29.583	116.916
Airtronics	Don Smith plans	Dave Platt	PPG automotive	90.583	18.792	109.375
JR	Bob Holman plans	Joe Moore	K&B epoxy	93.917	3.083	97
JR	BVM kit	BVM	Ditzler DAU	95.25	0	95.25
Airtronics	Ziroli plans/kit	Barton	Automotive lacquer	92.667	0	92.667

Tom Wood, F-18C, 4th Expert

Above: Ian Richardson/ Steve Elias, F-100D, 2nd Team

Helis

Gonzalo Martinez, Bell 230, 9th place

Mitch Weiss, F-100D, 5th Expert

As promised at last year's event, Top Gun 2002 featured flying competition for helicopters. The new Lakeland site was very well set up, and the heli pilots and judges had their own section separate from the fixed-wing flyers. Though there were occasional fixed-wing flyovers, the two elements seemed to coexist without any difficulties. Jerry Hicks was this year's Contest Director, and he did a great job coordinating the various heli activities.

Duey Lee, Boeing Vertol CH-47 Chinook, 7th place

Jeff Green, Dauphin 2, 2nd place

GENERAL RULES

To qualify for competition, the model must be a scale replica of a man-carrying helicopter that made multiple flights. To receive an invitation to compete, the entrant must be a recognized, experienced, scale-heli pilot. The model cannot weigh more than 50 pounds, and there is no limit on engine size. Model helicopters are judged with the same equipment as they are required to fly with. That means that the helicopter must fly with a scale rotor head and control system, or it will be severely downgraded. Flybar-equipped rotor heads are much easier to fly with than the scale-looking, flybarless versions, and this makes all the difference in piloting skill. The builder of the model also must declare in writing that he built the model from scratch, a kit, or a modified kit, and that he painted the model himself. To verify this, contestants must supply construction photos of themselves with their models.

Each contestant must supply documentation showing that the model is an accurate replica of the subject aircraft. The documentation package needs to include at least one

PILOT	AIRCRAFT	WEIGHT (lb.)	POWER	FUEL	RADIO	KIT
HELICOPTER						
1. Matteini	Long Ranger III	12	Rossi .65	FAI	Futaba	Vario
2. Green	⅛ Dauphin 2	15	O.S. .91	Morgan	Futaba	Hirobo
3. St. John	⅛ Bell 47G4A	22	G-23	Gas	JR	Vario
4. Bruns	⅛ Bell 47 OH13	13	Webra .61	Cool Power	JR	Vario
5. Robins	1/12 Hind 24D	18	O.S. .91	Wildcat	JR	Larry Jolly Plans
6. Wales	1/5.5 Aerospatiale Lama	23	O.S. 3500	Cool Power	JR	Hirobo
7. Lee	1/15 Vertol	12.5	O.S. .46	PowerMaster	Futaba	Hirobo
8. Tovey	⅛ Hughes 500	22	G-23	Gas	JR	—
9. Martinez	⅛ Bell 230	21	G-23	Gas	JR	Vario

Jets

Mark Frankel, F4D Skyray

Right: Paul McCaulley, T-33A, 8th Expert

Scale pilot and canopy detail on Joe Grice's F-100D

Gustavo Campana, L-39 Albatross, 2nd Expert

Sam Snyder/Thomas Dodgen, MiG 15, 4th Team

Paul Tovey, Hughes 500, 8th place

color photo of the subject aircraft for "Color and Markings" photos showing the aircraft's ground stance: notable landmark features such as doors and windows are also required. An accurate 3-view drawing from a published source is also required. Each helicopter must have a scale pilot figure, and any cockpit detailing that is visible through the windows must be replicated.

David St. John, Bell 47GA4-A, 3rd place

STATIC JUDGING

Three judges evaluate each helicopter, and they are allowed to approach the model and view it close up. The judges inspect the fuselage, the main-rotor and tail-rotor systems, landing gear, cockpit or cabin detailing and the model's overall finish, color and markings. Overall general appearance, detailing and craftsmanship are also evaluated.

Each contestant flies four, 15-minute rounds, each consisting of a series of mandatory maneuvers and a period of freestyle flight. The two highest scores are counted for the overall flight score.

Judging from the reaction of the crowd enjoying the helicopter flights, this portion of the event has a bright future that's bound to grow in popularity.

FINISH	STATIC	FLIGHT	TOTAL
Auto enamel	317.333	164	481.333
Standox Gloss	301.666	159	460.666
K&B epoxy	327	78.916	405.916
Chevron	263.333	164.5	358.166
Auto enamel	340.666	53.833	394.499
Rotary Flight	391.833	0	391.833
Hobby Poxy	305.333	0	305.333
Vario	280.666	2.833	283.499
DuPont	189.666	76.25	265.916

STATIC HELICOPTER AWARDS

Award	Pilot	Aircraft	Sponsor
Best Cockpit Interior	St. John	Bell 47GA4-A	Testors & Futaba
Best Civilian	Matteini	Long Ranger III	Century Heli
Best Military	Robins	Hind 24D	Altech Marketing
Critics Choice	St. John	Bell 47GA4-A	Airtronics
Best Finish	Green	Dauphin 2	The Zap Gang

Cliff Tacie, Aeronca L-16A, 2nd World Class

Roy Vaillancourt, Hawker Typhoon, 3rd Designer

Mike Gross, SE5a, 10th Expert

Dave Johnson, Siemens Schukert D-111, 6th Designer

Rich Feroldi, Fokker Dr. 1, 14th Expert

Tom Polapink, Pfalz, 12th Designer

Steve Sauger, Fairchild 24, 3rd World Class

PILOT	AIRCRAFT	WINGSPAN (in.)	WEIGHT (lb.)	POWER	FUEL	PROP
WORLD CLASS						
1. Torres	1/5 Beech T-34C-1	80	20	YS 1.40	Sig	—
2. Tacie	1/4 Aeronca L-16A	104	14	O.S. 1.60 twin	Wildcat	Zinger 18x6
3. Sauger	1/4 Fairchild 24	108	22	Moki 1.8	Sig	Zinger 18x10
4. Sousa	1/4 Culver Cadet	89	19	O.S. 1.60 twin	Morgan	Master Airscrew
5. Benjamin	1/4 Taylorcraft	108	21	AstroFlight 90g	36 cells	18x12 custom
6. Kretz	1/5 Dauntless SBD-3	85	23	Saito 1.82 twin	Cool Power	APC 17x6
7. Guenther	1/5 Zero A6M-3	79	22	O.S. 3500	Wildcat	Moki 18x10
8. Harwood	1/5 Aviatik C-1	99	16	Saito 1.50	PowerMaster	Zinger 18x6
9. Larsen	1/6 Avro 504N	72	11	Saito .90 twin	Wildcat	Zinger 14x6

World Class

World Class is Top Gun's version of the international FAI Scale competition. The new Top Gun class uses modified Scale World Championships rules. Two static judges and two flight judges were used at Top Gun (three static judges and five flight judges are usually used in FAI competitions).

Dave Platt, Miles M-20, 9th Designer

Below: Sergio Testa/Eduardo Bass, DC-3, 12th Team

John Guenther, A6M-3 Zero, 7th World Class

Halftime antics—a Lanier RC Sukhoi hovers over the midfield.

The scoring program uses "K" factors to adjust the scores. During each flight, the maneuvers are evaluated in terms of difficulty. For example, the Takeoff maneuver has a K factor of 8. If you earn a raw score of 8, it is then multiplied by the K factor, and that gives you a final adjusted score of 64. The most difficult maneuver is "Approach and Landing" (actually, two maneuvers combined); it has a K factor of 10. If you receive a 9 for landing, the K factor gives you a 90 final score.

All of the required maneuvers have K factors between 2 and 10. Here's the breakdown.

- **K8 Takeoff**
- **K2 Straight Flight**
- **K6 Figure-8**
- **K6 Descending 360-degree Circle**
- **K10 Approach and Landing**
- **K4 Optional Maneuvers**

"Realism in Flight" is scored as the 11th maneuver and includes the following K factors:

- **K2 Engine sound (realistic tone and tuning)**
- **K4 Scale speed of the model**
- **K4 Smoothness of flight**
- **K3 Maneuver size**

The model weight limit was also increased at Top Gun to 15kg (33.33 pounds). This change will also become effective at the 2005 World Championships and FAI Competition.

STATIC SCORING

The Static portion of the competition is more demanding than the AMA Sport Scale competition that Top Gun's scoring is based on. More documentation is required, and models built from kits don't usually do well in static scoring. The modeler must declare all the parts that he did not actually build himself. These items include the tires, wheels, dummy engines, molded canopies, engine cowls, static props, bombs, etc. Any kit that uses fiberglass fuselages and foam wings is OK, as long as the builder shows that he built the plugs and forms himself. In the World Scale class, a simple plane that is very well built, finished and documented has as good a chance of winning as a very complicated airplane that isn't documented as well.

In true FAI competition, the modelers fly three rounds, and the lowest flight score is dropped. At Top Gun, four rounds are flown, and the two lowest scores are dropped. The two highest flights are then averaged for a total flight score, which is then added to the final static score to determine the modeler's overall final score. —*Stan Alexander*

Editor's note: Stan Alexander has been a Top Gun flight judge since the event's second year and is the president of the National Association of Scale Aeromodeling.

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Traplet Publications

RADIO	PLANS/KIT	GEAR MFR.	FINISH	STATIC	FLIGHT	TOTAL
Futaba	SELF/RT Aerospace	RT Aerospace	Polyurethane	1154	1198	2352
Airtronics	Bud Nosen kit	—	Coverite & dope	1046	1192.5	2238.5
Airtronics	Self	—	Dope & fabric	1107	1118.5	2225.5
Airtronics	Vern Clements plans	Century Jet	Stits system	1028	1152.5	2180.5
Airtronics	Self	—	Stits	1026	1099.5	2125.5
Futaba	Jerry Bates plans	Robart	Chevron	1111	457	1568
JR	Dave Platt plans	Century Jet	Epoxy	1037	493.625	1530.625
JR	Self	—	—	1071	0	1071
Ace	David Boddington plans	—	Sig dope	992	0	992

Brian O'Meara/James Hammond, F4U Corsair, 10th Team

TECH TALK

Type
Airplanes 58
Helicopters 9
Jets 12
Civilian 10
Military 46
Biplanes 9

Radios
JR 33
Futaba 17
Airtronics 14
Ace 1

Engines
Zenoah 7
Moki 5
O.S. 5
Saito 5
Brison 3
3W 3
Laser 2
Quadra 2
D&B 1
Eagle 1
Enya 1
MacMinarelli ..1
Sachs 1
Seidel 1
Webra 1
YS 1
ZDZ 1

Turbines
RAM 6
AMT 5
SimJet 1
Jet Cat 1

Electric motors
AstroFlight 1
MaxCim 1

Fuel
Gasoline 23
Wildcat 13
Jet-A 11
Cool Power 5
JP-4 3
Sig 2
Morgan 2
PowerMaster ..2
Omega 1
Red Max 1
Byron 1
FAI 1

Paul Donofrio/Anthony Greco, Sikorsky S-39B, 6th Team

David Pinegar/George Maiorana, TU-4, 3rd Team

David and Peter Malchione, F-4 Phantom, 5th Team

PILOT	AIRCRAFT	WINGSPAN (in.)	WEIGHT (lb.)	POWER	FUEL	PROP
TEAM						
1. Grice/Schulman	1/8 F-100D	70	35	AMT	Jet-A	Turbine
2. Richardson/Elias	1/8.8 F-100D Super Sabre	70	31	AMT Pegasus	Jet-A	Turbine
3. Maiorana/Pinegar	1/4 TU-4 (Stalin B-29)	—	—	MaxCim NEO-13Y	48 cells	13x10 4-blade
4. Snyder/Dodgen	1/8 MiG-15	68	24	Jet Cat 120	Jet-A	Turbine
5. P. Malchione/D. Malchione	1/8 F-4 Phantom	60	26	RAM 1000	Jet-A	Turbine
6. Donofrio/Greco	1/4 Sikorsky S-39B	156	45	B&D .51	Gas	Varipitch 24
7. Labonte/Skillings	1/5 Harvard Mk. IV	101	38	Sachs 4.2	Gas	—
8. Salles/Esteves	1/3 Spacewalker	104	22	Eagle 3.2	Gas	Moki 22x10
9. Siewert/Sandquist	1/6 P-47D	82	33	Brison 4.2	Gas	Moki 22x10
10. Hammond/O'Meara	1/6 F4U Corsair	82	24	Webra Bully	Wildcat	Moki 18x8
11. Hahn/Christensen	1/24 L-10L	85	27	Sim Jet	Jet-A	Turbine
12. Bass/Testa	1/8 DC-3	140	48	G-38	Gas	16x8 3-blade
13. Barastain/Pierson	1/4 PT-19	114	37	G-62	Gas	Moki 22x10

War Paint

Since airplanes were first used as weapons of war, pilots have used nose and tail art to personalize their planes and intimidate the enemy. Here are just a few examples of the unique nose and tail art found on the aircraft at Top Gun.

INTERNATIONAL SPORT AVIATION MUSEUM

Situated on a 40-acre campus adjacent to the Lakeland Linder regional airport, the Florida Air Museum houses an impressive collection of aircraft and memorabilia and is the home office for the Sun 'n Fun Foundation. Also known as the International Sport Aviation Museum, the facility is home to approximately 35 experimental and homebuilt aircraft along with several outdoor displays. The museum's collection currently includes experimental homebuilt and military aircraft and several Ultralights, many built from scratch.

Classic homebuilts such as the Acro Sport biplane, the Bede BD-5 pusher, Peter Bowers Fly Baby and the venerable Pitts Special S1-A made the museum a documentation gold mine for any scale modeler who took the short ride over from the Top Gun flightline.

Antique and classic aircraft were also on display; they included a 1936 Aeronca C-3 Master, a 1943 Beechcraft D-17S Staggerwing and a 1941 Porterfield CP-65 Collegiate. If you want something really different, there is even a 1954

Convair YF2Y-1 Sea Dart on display right outside the hangar door! +

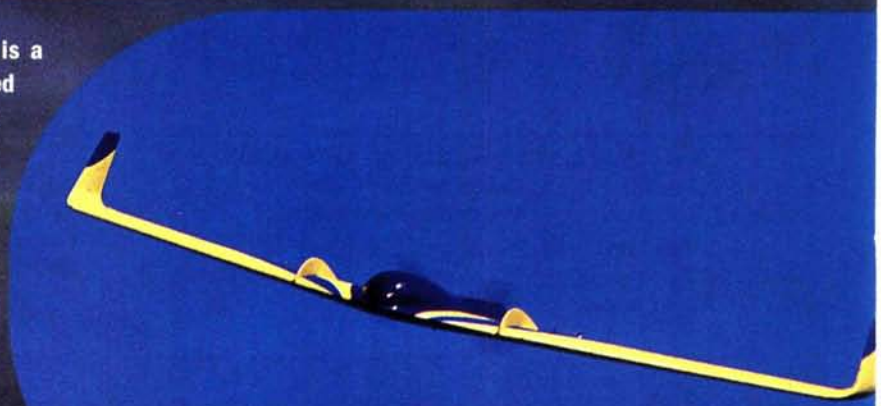
RADIO	PLANS/KIT	GEAR MFR.	FINISH	STATIC	FLIGHT	TOTAL
JR	BVM kit	BVM	Aluminum plate	98.917	98	196.917
JR	BVM kit	BVM	BVM Metal Kote	97.417	96.625	194.042
Futaba	George Maiorana plans	Maiorana	Aluminum tape	97.917	95.25	193.167
JR 10X	BVM kit	BVM	PPG automotive	96.333	93.417	189.75
JR	BVM kit	BVM	PPG	95.917	92.958	188.875
JR	Paul Donofrio	Paul Donofrio	Randolph dope	96.167	92.25	188.417
JR	Yellow Aircraft kit	Barton	Automotive lacquer	95.147	92.77	187.917
JR	Sig kit	—	Coverall & enamel	98.083	87.167	185.25
Futaba	Aerotech kit	Robart	Automotive	95.583	83.042	178.625
Airtronics	Bob Holman kit	Barton	K&B epoxy	90.167	87.042	177.209
JR	PCM Models	Robart	PPG	93.333	57.292	150.625
Airtronics	Ziroli plans	Robart	Urethane	95.75	21.75	117.5
Futaba	Hostetler plans/AI	Annco	Automotive	93.75	11.375	105.125

Jet Set Models

Viper Twin

by John Tracey

Power-packed park flyer



The Viper Twin from Jet Set Models is a high-powered, park flying wing. Powered by two direct-drive 6V Speed 400 motors, the Viper Twin is available in three versions: thermal, motor kit and electric. They increase in parts count and value, starting with the thermal and ending with the electric.

Although this flying wing was designed to burn holes in the sky, it is still able to slow down and fly well in a confined space. The low wing loading (nearly 9 ounces per square foot) aids its slow flying capability. At the other extreme of this plane's versatile flight envelope is speed. Push that throttle stick forward, and it goes ballistic!

FLIGHT PERFORMANCE

HAND-LAUNCHING

The Viper Twin is easy to launch. Two holes in the underside of the wing accommodate your fingers when you launch it. These holes also serve as center-of-gravity (CG) locaters. The model balances perfectly with an 8-cell, CP 1300mAh battery placed in the nose.

The instructions direct you to launch the plane at ½ throttle, and thanks to the thrust produced by the twin motors, that is all the throttle you'll need to get this plane in the air. Toss it forward in a slight nose-down attitude to get the speed up, and it will take off. The Viper Twin's climb rate is awesome. With a few small tweaks of trim, the model will fly flat and level.

GENERAL FLIGHT CHARACTERISTICS

The Viper Twin's stall speed is very low as long as the bank does not get too steep. This plane has a lot of power to move out in a hurry, but it still has the potential to maneuver in smaller areas. The Viper also has enough power and speed to penetrate a fair amount of wind.

The model averages 7-minute flights with the 1300mAh battery pack and about 9-minute flights with the 1700mAh pack. With the 9-cell, 1300mAh pack, there is a noticeable increase in speed. I also tried both the included Gunther prop and the carbon-fiber upgrades. There's a slight increase in speed with the carbon props, but the Gunther props seem to have more thrust.

AEROBATICS

Loops can be big and round or tight and small. It tracks very well through all its maneuvers. The rolls are almost axial. The Viper Twin is rock-solid stable in the air. Not only does this plane love to fly inverted, but outside loops are also well within its capability. This thing is fun to fly!

SPECIFICATIONS

MODEL: Viper Twin Electric

TYPE: flying wing

MANUFACTURER: Jet Set Models

WINGSPAN: 55 in.

WING AREA: 475 sq. in.

WEIGHT: 27 oz.

WING LOADING: 8.2 oz./sq. ft.

POWER SYSTEM: two 6V Speed 400 motors (included)

RADIO REQ'D: 3-channel w/mixing (speed control and elevons)

RADIO USED: Futaba 6XAS transmitter, GWS GWR-6N receiver and two Dymond D-60 high-torque microservos

SPEED CONTROL: Castle Creations Pixie 20 (included)

BATTERY: 8-cell Sanyo CP 1300mAh SCR (included)

PROPS: Gunther (included)

PRICE: $69.99 (thermal); $109.99 (motor kit); $149.99 (electric)

FEATURES: molded Arcel foam airframe; interlocking joints; triple carbon-fiber rod-spar system; Pixie 20 ESC prewired with Deans connectors; Lexan canopy included.

COMMENTS: this foam flying wing is in a class of its own. The Viper Twin combines high power with a light wing loading to create an incredible flying package.

HITS
- Quick and easy to build.
- High-quality electronics included.
- Carbon-fiber-reinforced wing.

MISSES
- None.

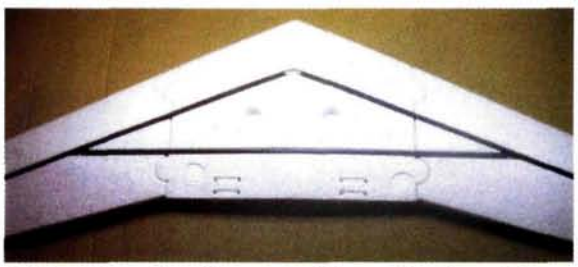
The Viper Twin Electric comes with nearly everything you'll need except the radio gear. The molded-foam airframe makes for a very easy assembly.

WHAT'S IN THE BOX?

The airframe is molded from five interlocking Arcel foam pieces, including two small tiplets. The interlocking design makes it simple to align the parts and ensures the proper wing dihedral. The Arcel foam is lightweight and durable, which contributes to the wing's crash resistance. For rigidity, a triangular carbon spar reinforces the wing.

The Viper Twin Electric features a tri-carbon-spar system and a newly redesigned Lexan canopy. It comes with all of the necessary hardware, two servo extensions, two 6V Speed 400 motors, two Gunther props, a motor-wiring harness with low-resistance Deans connectors and an 8-cell, Sanyo CP 1300mAh Ni-Cd battery pack with Deans connectors. If that isn't enough, the Viper Twin Electric also comes with a state-of-the-art Castle Creations Pixie 20 speed control that's also prewired with Deans connectors.

A few accessory upgrade packages are available for the Viper Twin, including stall fins, a set of 5x5 carbon props and hubs and an 8-cell, 1700mAh and 9-cell, 1300mAh battery pack. I tried all of the upgrades; see the "Flight Performance" sidebar for the results.



A triangular carbon-fiber spar reinforces the wing, adding to its rigidity and durability.

ASSEMBLY

The Viper Twin was both exciting and easy to build. The instructions were well written, with multicolored text to highlight important points. The full-color illustrations were plentiful, and each step was clear and easy to follow.

This plane went together so smoothly that there's little to tell about it. It took only about an hour to completely assemble, not including painting it.

The interlocking foam wing pieces were easy to assemble. A light film of 5-minute epoxy proved to be sufficient for holding

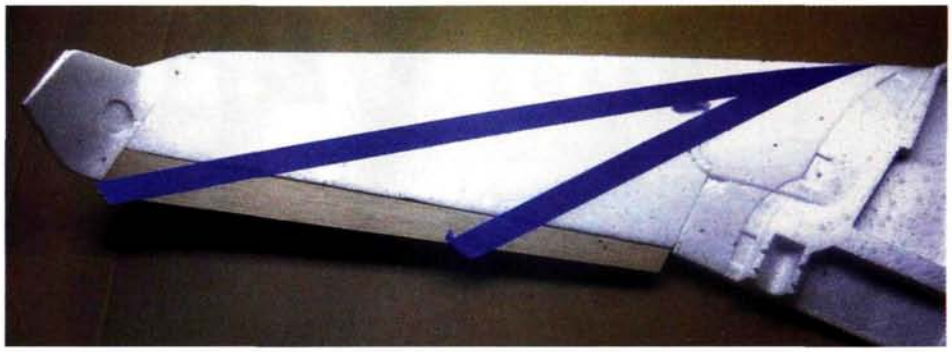
A light coat of 5-minute epoxy holds the parts of the wing together.

the pieces together. Don't forget that the carbon rods are responsible for most of the wing's strength. An angled aluminum tube holds the two larger carbon spars together in the nose. I noted that there was limited clearance between the front and rear spars. If the rear spar is not perfectly centered, it will be in the way of the front spar. I simply changed the order of the instructions and inserted the front spars first. (According to Jet Set, this has already been changed in the latest version of instructions.) The rear spar then slips in between the front spars. I again used very little epoxy and spread it evenly to help keep the weight down.

PAINTING

At this point, the color scheme needs to be laid out. One of the nice things about the Arcel foam, aside from its durability, is that it can be painted with various types of paint that would melt ordinary white foam. In fact, this stuff is so tough it can actually be glued with cyanoacrylate (CA). The only downside to Arcel is that it does not take sanding well. I recommend just painting it.

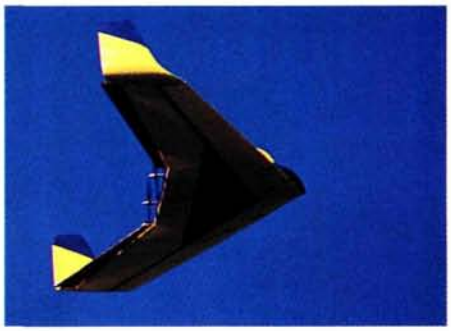
I used masking tape to lay out my lines and brush-painted the model with acrylic craft paint. Because I needed to paint before I hinged the elevons, I just used the



I used masking tape to hold the elevons in place while I painted the model.

With the battery mounted in the nose, the model balances perfectly. The inclusion of the two servo extensions needed to reach the receiver is a nice touch.

masking tape to hold each elevon in its intended position while I painted it. The paint bled through the masking tape in a few spots, so I used pinstriping between my color transitions. The Lexan canopy should be painted on the inside to keep it scratch resistant and to give it that clearcoat shine. All in all, it took longer to paint the model than to perform any other step in the assembly. It was a lot of fun, though, and well worth the time spent.



CONTROL SURFACES, RADIO EQUIPMENT AND MOTOR INSTALLATION

The balsa elevons are laser-cut, and the holes for the control horns are already cut out. This made installing the horns a snap. I hinged the elevons with the included high-quality hinge tape.

Because the servo bays were molded to accommodate HS-55 servos, I had to cut them out a bit to fit the slightly larger D-60s. After this adjustment, the servos slid easily into their bays, and I secured them with pieces of hinge tape. Another simple, but nice, feature of this kit is that it included two servo extensions, which are necessary to reach the receiver.

After soldering the motor leads into place on each motor, I used the included zip straps to secure the motors in place. I reinforced the front of the battery compartment with a little strapping tape and used hook-and-loop fastener to hold the receiver, electronic speed control and battery in place. The canopy is also held in place with the same type of fastener.

CONCLUSION

The Viper Twin is an excellent plane. The quality of the included parts and the design of the plane are unmatched, and it is an extremely easy build. The electronics package and hardware included in this kit are the best I have seen yet. The value is also hard to beat.

I found this plane to be a pleasure to build and fly, and I highly recommend it to anyone with a thirst for power. The Viper Twin is a park flyer that will keep up with the big boys.

Dymond Modelsports USA Ltd.
(888) 4FUN FLY; (920) 303-1100; rc-dymond.com.

Futaba Corp. of America
Distributed by Great Planes Model Distributors Co. (800) 637-7660; futaba-rc.com.

***GWS** (Grand Wing Servo); distributed by Balsa Products (732) 634-6131; balsapr.com; and Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

***Jet Set Models Inc.** (732) 539-8002; jetsetairplanes.com.*

Great Planes Dazzler 40 ARF

Dazzling aerobatic performer

by Vic Bunze

I have always found that my flying improves when I have a highly maneuverable plane that does not represent a major investment and requires very little maintenance—in other words, a carefree flying plane that allows me to let it all hang out. Great Planes' Dazzler ARF is such a plane.

The Dazzler has a one-piece airframe; other than fueling it, nothing has to be done at the field. Quite convenient!

PHOTOS BY WALTER SIDAS & VIC BUNZE

SPECIFICATIONS

MODEL: Dazzler 40 ARF

MANUFACTURER: Great Planes Model Mfg. Co.

DISTRIBUTOR: Great Planes

TYPE: sport aerobatic ARF

WINGSPAN: 48 in.

WING AREA: 578 sq. in.

WEIGHT: 4.85 lb.

WING LOADING: 19.5 oz./sq. ft.

LENGTH: 43 in.

ENGINE REQ'D: .32 to .46 2-stroke or .40 to .52 4-stroke

ENGINE USED: O.S. .46 SF

RADIO REQUIRED: 4 channels with 5 servos (rudder, elevator, throttle and 2 for ailerons)

RADIO USED: JR 10X with 5 Hobbico servos

FUEL USED: Wildcat 15%

PROP USED: APC 11x4

PRICE: $159.99

FEATURES: built airframe covered with preprinted heat-shrink film, includes pushrods, prebent landing gear, wheels, engine mount, fuel tank, spinner and photo-illustrated assembly manual.

COMMENTS: the Dazzler is designed to provide exhilarating flights in a compact package with big-plane performance. The wing is permanently attached, and the plane fits easily into a car trunk or back seat. It has a thick, semisymmetrical wing for slow landings and smooth maneuvers. It has unlimited vertical performance with the O.S. .46 SF and can be flown most of the time at ½ throttle.

HITS

- Outstanding sport aerobatic plane.
- Nicely constructed and easy to assemble.
- Excellent instruction manual.

MISSES

- None.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

The plane accelerates on a straight track with slight application of right rudder, and it lifts off smoothly with a little elevator backpressure. All takeoffs are quick and easy.

The generous wing area, thick, semisymmetrical airfoil and

low wing loading make for easy, gentle landing characteristics. Landing approaches can be made fairly steeply without a lot of speed build-up. Once the model has landed, it handles beautifully with the tailwheel steering.

LOW-SPEED PERFORMANCE

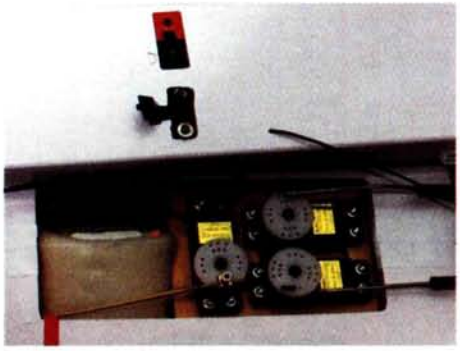
The Dazzler has excellent slow-speed flight characteristics. It slows down nicely under solid control. It doesn't have any tendency to snap when it stalls, and it can do slow-speed aerobatics at ½ throttle—a lot of fun!

HIGH-SPEED PERFORMANCE

Using a low-pitch, 11x4 propeller, top-end speed is moderate. This is my preference, as it provides more vertical performance and less acceleration through down-lines. The Dazzler is very responsive at high speeds, but it's still easy to control and tracks well. It doesn't exhibit any high-speed stalling characteristics in tight turns or loops.

AEROBATICS

The airfoil's blunt leading edge contributes to a constant speed profile through maneuvers such as loops, Cuban-8s and split-S's. The Dazzler will do just about any maneuver you want it to. Inverted performance is similar to upright and requires only slight down-elevator pressure; spin recovery is immediate. The Dazzler has good tracking through maneuvers and requires little correction to stay on course. The O.S. .46 SF with the APC 11x4 provides unlimited vertical performance.



Below: the main radio-compartment hatch is on the bottom of the fuselage and is held in place with nylon straps and screws. I mounted the receiver switch and charging jack on the hatch.

KIT FEATURES

The Dazzler is beautifully constructed of balsa and plywood and expertly covered in a dazzling array of six colors printed on heat-shrink covering material. It is complete with all the hardware, an engine mount, fuel tank, wheels, clevises, horns and pushrods—everything required to complete the model. Many of the assembly steps have already been done, so it's incredibly easy and quick to put together—one weekend or a few nights.

ASSEMBLY

Wing and fuselage. The wing comes with the ailerons installed and hinged, and keeper pins further secure the hinges to the wing's trailing edge. First, join the wing halves with the wing joiner that must be epoxied into slots between the main wing spars. Then epoxy the wing to six triangles that are added to the inside of the wing-saddle area of the fuselage. The bottom of the wing at the fuselage is an open bay in which a precut servo tray is mounted, and there's also room for the receiver and battery. The large hatch cover is secured to the fuselage with four nylon straps and eight screws. I mounted the on/off switch and the charging jack on the hatch so that I don't have to open the hatch for normal flight operations.

The main part of the fuselage is complete out of the box and includes installed pushrod guides for the rudder and elevator. The aluminum engine mount and the canopy are also in place. You just attach the tail group. The precut slots for the stabilizer and vertical fin are accurately cut and greatly facilitate their alignment.

• **Final assembly.** The horizontal stabilizer and elevators are hinged, and the elevator halves are joined. I had only to remove the covering material where the horizontal stabilizer had to be glued to the fuselage. The same applied to the vertical fin.

The supplied universal aluminum engine mount easily accommodates a variety of engines in the recommended .32 to .52 range by using hold-down plates that have to be bolted down over the engine lugs, and the O.S. .46 SF fit well. The throttle linkage is a flexible, stranded-steel cable routed through a plastic guide tube and attached to the throttle arm using a screw-lock connector.

The fuel tank fits into the forward hatch area. I set it up using two lines, and I routed these pressure and feed lines through the center opening in the engine mount. The forward hatch is secured with four small screws.

• **Flight setup.** When I set up the Dazzler, I used the recommended control throws of ⅜ inch for the low rate and ½ inch high rate for the elevator. The aileron rates are ⅜ inch for low rate and ¾ inch high rate. I also included outrageous rates for 3D flight modes; I added ¼ inch of elevator and aileron throw. I also added some exponential because I increased the throws. Low rate has no exponential; mid-rate has 40 percent; 3D rates use 65 percent. The dual aileron servos allow me to add a flaperon mix for coupled elevator-to-flap mixing for tighter loops and tumbles.

CONCLUSION

I get a lot of enjoyment from the Great Planes Dazzler. It's capable of a full complement of maneuvers and is compact and easy to transport. It goes together effortlessly and is beautifully made. Its dazzling covering colors are head-turning and draw many looks at the field. Fly it with a standard radio system, or set it up as a 3D trainer. At the field, it doesn't require any assembly; just fuel up and fly. This is the type of plane you will always enjoy flying. ✈

APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.

Great Planes Model Mfg. Co. (800) 637-7660; greatplanes.com.

JR; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

Hobbico; distributed by Great Planes; hobbico.com.

O.S.; distributed by Great Planes; greatplanes.com.

PHOTOS BY VIC OLIVETT & WALTER SIDAS

Giantscaleplanes.com

Boeing P-26 Peashooter

Quick-build classic

by Vic Olivett

Designed in 1931, the Boeing P-26 Peashooter was a novel aircraft that incorporated some firsts in aviation. It was the first all-metal pursuit monoplane produced for the U.S Army Air Corps, and it was the first plane to use flaps to reduce landing speeds. The P-26 was also the last Army Air Corps pursuit aircraft with an open cockpit, a fixed undercarriage and an externally braced wing. Giantscaleplanes.com now offers a very nice, almost-ready-to-fly (ARF) model of this early fighter.

THE KIT

This is truly an ARF model, as the fiberglass fuselage is gelcoated and finished; no paintwork is necessary. The tail group and the foam-core, balsa-sheeted wing are finished in a yellow iron-on covering, and the fiberglass landing-gear covers are finished to match the color scheme. A nice decal sheet is also included to finish the Peashooter.

The manual is adequate if you've built this type of model before, but if this is your first one, you may find yourself wishing that it included a little more information and some helpful hints.

SPECIFICATIONS

MODEL: Boeing P-26 Peashooter

MANUFACTURER: Giantscaleplanes.com

TYPE: standoff-scale ARF

WINGSPAN: 71 in.

WING AREA: 736.25 sq. in.

LENGTH: 51 in.

WEIGHT: 8.2 lb.

WING LOADING: 25.43 oz./sq. ft.

ENGINE REQ'D: .60 2-stroke or .91 to 1.20 4-stroke

ENGINE USED: Saito FA-90R3D radial 4-stroke

RADIO REQ'D: 4-channel with 5 servos

RADIO USED: JR XF631 with 5 JR 4131 servos (ailerons, elevator, throttle, rudder)

FUEL USED: Wildcat 15% nitro

PROP: APC 14x7

PRICE: $279.99

FEATURES: gelcoated-fiberglass fuselage, cowl and wheel pants; foam-core balsa-sheeted wing, tail feathers and wing covered in heat-shrink plastic film; includes flying wires and decals.

COMMENTS: the Boeing P-26 is a scale subject that, until now, has intimidated sport fliers. By increasing the aspect ratio, widening the main gear stance and giving the wing a thick, sport airfoil, Giantscaleplanes.com has turned this Golden Age classic into a Sunday flyer. This Peashooter is a "sweet pea" in the air.

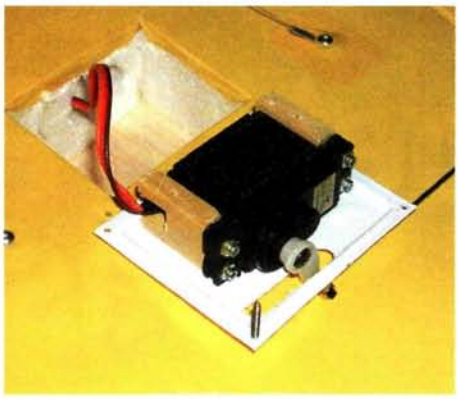
HITS
- Easy to assemble.
- High-quality fiberglass parts.
- Classic looks.
- Fine flight characteristics.

MISSES
- Landing gear is too flexible.

ASSEMBLY

Wing. The servos are mounted on the wing halves out near the ailerons. The servo lead channels extend from the aileron servo bay to the wing root. You'll need to cut an exit hole for the leads just above the channel at the root.

A lite-ply joiner connects the wing halves. To hinge the ailerons to the wing, I used Robart hinge points; each aileron already has hard points in place for the control horns. Look carefully, and you will see them under the covering. After installing the aileron servos, test them for proper clearance and movement.



The aileron servos are mounted on plastic hatches that screw to the bottom of the wing. Glue the servo-mount blocks to the hatch to accommodate the servo you use.

Next, I flipped the wing upside-down and started work on the landing gear. After installing one of the gear legs, I found that the long strut was overly flexible. I knew that this would cause problems on takeoff and landing, so I decided to add a brace from the landing-gear leg to an anchor placed to the rear of the leg. This kept the gear from flexing too much and stiffened it significantly. It's a simple fix and will help save you from damaging the pants, and maybe the plane, during takeoff and landing.

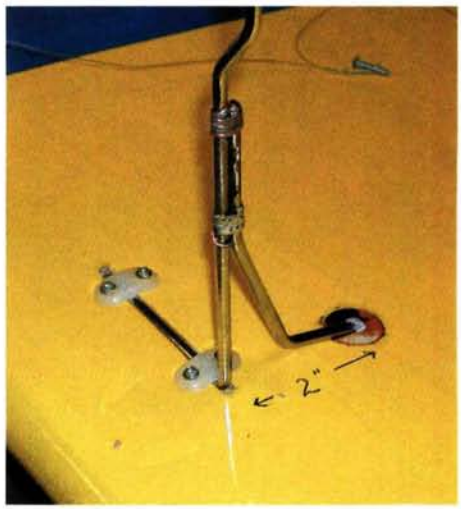
The wing has several hard points for the flying wires that you'll attach later and the wires for the landing-gear fairings are very important; they help stiffen the assembly and hold the fairings in place. The flying wires also look very nice on the completed model.

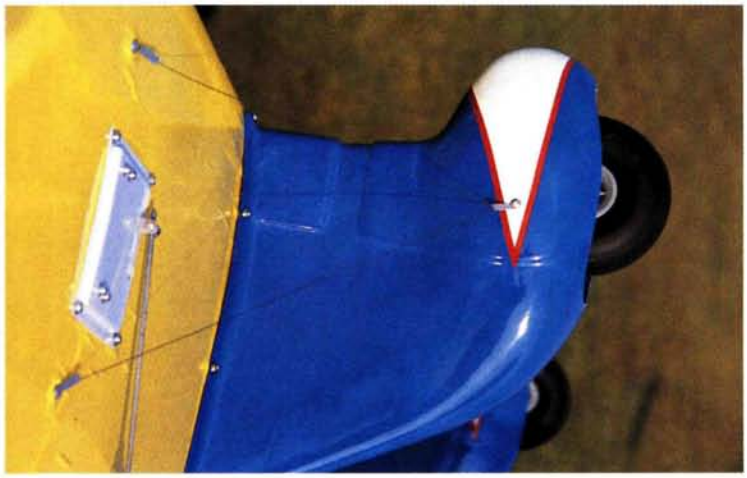
Fuselage and tail group. The Peashooter fuselage is well designed, and the firewall is strong enough to handle just about any engine you choose; it has hard points installed in it for the upper flying wires. A tail post needs to be installed at the rear of the fuselage; I used epoxy to secure it in place and then installed the tailwheel assembly on the rudder before hinging the rudder in place.

I slid the horizontal stabilizer into a slot at the rear of the fuselage, and when I checked the incidence, I found that it was right on the money. I recommend that you do all of the hinge work without using glue before you glue the stabilizer in place. This allows for an easier installation and less hangar rash.

Engine. With its large, round cowl, the Peashooter just begs to have a nice-looking radial engine. My powerplant choice was the Saito FA-90R3D. The Saito radial is very easy to install, and I bolted it directly to the firewall without any spacers. I mounted the fuel tank just behind the firewall; this allows proper clearance for the throttle linkage from the engine to the servo.

I attached the cowl to the fuselage with the supplied cowl ring and bolted them on the firewall. I used the paint trim on the side of the fuselage to align the cowl,





Above: I thought the landing-gear legs were too flexible, so I added an additional support. I secured it to the gear leg and to a hard point that I added to the wing.

Left: the wheel pants completely cover the landing gear and really enhance the Peashooter's looks. The flying wires and screws secure them in place.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

With its light wing loading and thick airfoil, the Peashooter is very stable during takeoff and landing. The model has a somewhat high stance when it's sitting on the ground, and this means you'll need to be on the elevator during takeoff runs and landing rollouts. When taxiing, I use full up-elevator, and as the takeoff run speed builds, I neutralize the elevator as the lift builds. Don't hold too much up-elevator, or you could put the plane into the air prematurely, and it could snap.

On landings, to avoid nosing over, you'll need to feed in up-elevator as the model touches down and loses speed during rollout. Once you have a feel for the Peashooter, you'll find that it flies like a sport plane during takeoff and landing. The model's widened stance makes taxiing very stable.

LOW-SPEED PERFORMANCE

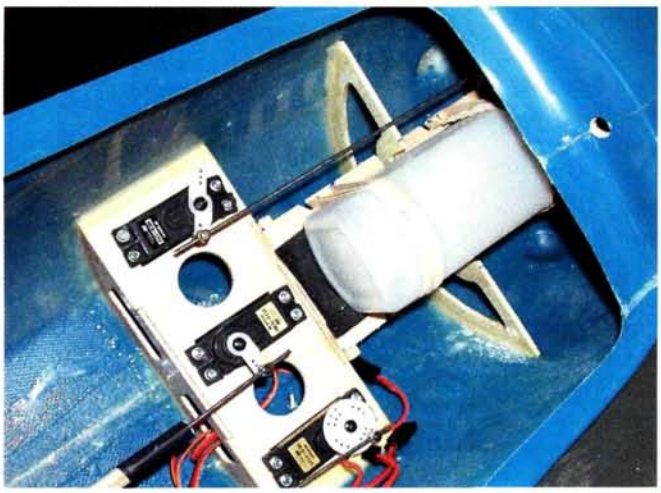
Because of its low wing loading, the Peashooter is fantastic at low speeds, but with its considerable frontal area, flying wires and big wheel pants, the P-26 has a lot of inherent drag. When flying slowly in windy conditions, it's wise to keep the power up to prevent the speed from bleeding off so quickly that you're caught off guard. This is something to really watch out for when turning downwind at lower throttle settings.

HIGH-SPEED PERFORMANCE

The Saito radial engine and APC 14x7 propeller combination is a perfect match for this airframe. With the drag of the design, the Peashooter isn't a rocket, nor should it be. All controls respond very crisply at high speeds.

AEROBATICS

Although the Peashooter of the 1930s wasn't designed for aerobatics, barnstorming with this model is a lot of fun. Spins are my favorite maneuver, and they are a sight to behold; recovery is instantaneous. I also enjoyed watching the plane perform loops, rolls and even an avalanche or two. This is one, fun, Golden Age beauty that flies like a sport plane, and I love flying it. I think you will, too!



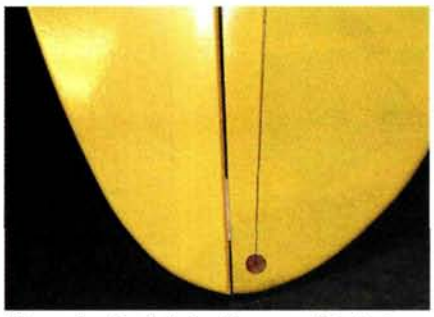
Above: the fuselage's interior is absolutely cavernous; the servos look lost. Note the simple and effective way that the fuel tank is secured. Below: mounting the cowl is super easy. Attach the plywood ring to the firewall (clearing the engine) and then match the trim lines on the cowl to the fuselage. Then it's a simple matter to glue the cowl to the plywood ring.

and the match was perfect. To strengthen the inside of the cowl's front ring, I added a fillet of epoxy and microballoons. This may save some damage to the cowl on a nose-over landing.

Finishing details. The Peashooter kit comes with a servo tray that will accept almost any standard-size servo; it also has room to mount the receiver. Use high-torque servos (I used JR 4131 servos); this is a big airplane, and I'm sure that you'll do more than just straight and level flying!

I balanced the plane using just the battery pack and added no dead weight. The switch can be placed just about anywhere, and the large, hollow fuselage has more than enough room to add any goodies you might want to install.

The Giantscaleplans.com P-26 Peashooter comes with a very nice decal package so that you can finish the plane to look like the one on the box cover. The flying wires add a nice touch, and they are needed on the bottom of the wing to support the landing-gear cuffs. I installed the windscreen and a pilot, and the Peashooter was ready to go.



Above: hard points for the many flying wires are preinstalled in the wings and fuselage. This makes attaching the flying wires easy.

CONCLUSION

This is one beautiful plane. The color choice was perfect, and the easy construction will save you many hours of work. If you like the look of old classics, you're going to like this one.

APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.

Giantscaleplanes.com (610) 282-4811; giantscaleplanes.com.

Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

JR; distributed by Horizon Hobby Inc.

Robart Mfg. (630) 584-7616; robart.com.

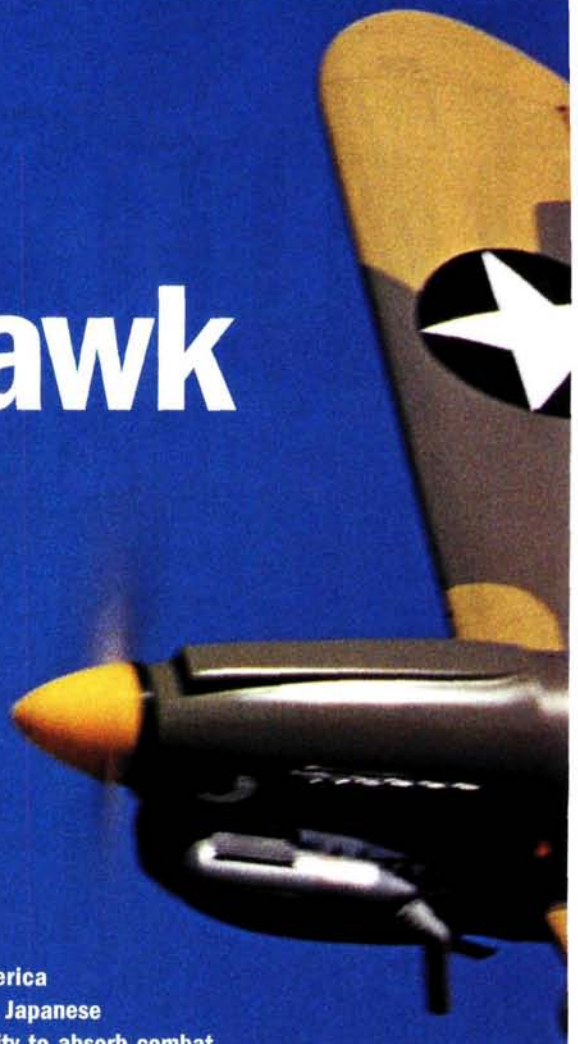
Saito; distributed by Horizon Hobby Inc.

Wildcat Fuels (859) 885-5619; orders-only line (888) 815-7575; wildcatfuel.com.

Kyosho P-40 Warhawk ARF

by John Kotleba

.40-size flying tiger



The Curtiss P-40 was the U.S. Army Air Corps' primary fighter when America entered WW II. Though it lacked speed and maneuverability compared with Japanese and Luftwaffe fighters, the P-40 had a reputation for strength and the ability to absorb combat damage. Its weight allowed excellent diving speed that complemented the battery of six, .50-caliber machine guns. Nearly 14,000 P-40s were manufactured during its five-year production run.

The almost-ready-to-fly (ARF) .40-size P-40 Warhawk is one of Kyosho's popular Super Quality Series line of warbirds. It is an authentic re-creation of one of WW II's most famous fighters, with a scale appearance that is true—right down to the distinctive shark's-mouth nose art.

WHAT'S IN THE BOX?

On opening the box, I discovered that all of the major balsa and plywood sections had already been assembled and covered with pressure-sensitive, adhesive-backed film in a flat camouflage olive-green-and-tan color scheme. This film also adorns printed panel lines, rivets, hatches and enough markings to bring a smile to the face of even the most experienced scale modeler. The only decal that needs to be applied is the famous shark's mouth on the nose.

PHOTOS BY JOHN KOTLEBA

SPECIFICATIONS

MODEL: P-40 Warhawk

MANUFACTURER: Kyosho

DISTRIBUTOR: Great Planes Model Distributors

WINGSPAN: 56 in.

LENGTH: 46.5 in.

WING AREA: 527 sq. in.

WEIGHT: 6 lb., 6 oz.

WING LOADING: 27.8 oz./sq. ft.

RADIO REQ'D: 4-channel w/5 servos (elevator, rudder, throttle, ailerons); 5-channel w/6 servos (optional retracts).

RADIO USED: Airtronics Radiant 6-channel w/6 Hitec servos

ENGINE REQ'D: .40 to .46 2-stroke or .52 4-stroke

ENGINE USED: O.S. Max .50SX Ring 2-stroke

PROP USED: Zinger 11x6

FUEL USED: Wildcat Premium Xtra 15% nitro

PRICE: $199.99 (Hobbico retracts, $35.99)

FEATURES: balsa and ply construction; two-piece, semisymmetrical, all-wood wing; factory covered in camouflage tan and olive green; prepainted, fiberglass-reinforced plastic cowl; plastic molded wheel-well inserts; optional 90-degree rotating mechanical retracts.

COMMENTS: the P-40 Warhawk can be assembled quickly and easily flown by pilots who have intermediate or advanced skills. Mine receives a lot of attention at the flying field.

HITS

- Great flight performance.
- Excellent overall appearance.
- Roomy fuselage.

MISSES

- Sags in covering.
- Shark's-mouth decal was difficult to apply.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

The plane tracks straight and true down the asphalt runway without any rudder input, but on the first flight, the Warhawk took us by surprise when it leapt upward on its own and started to bank. The Warhawk is extremely sensitive to aileron movement. Thanks to the semi-light wing loading and some quick reflexes, recovery was quick. Just a little right aileron and down-elevator on the trim tabs is all it needs for smooth, level flight. Set at 100mm from the leading edge with gear up, the CG is perfect.

The P-40 lands in typical warbird fashion. Reducing power from ½ to ⅓ over the course of the descent results in a very moderate sink rate. Once the plane reaches the runway's apron, I throttle back to idle. After an extremely smooth main-wheels landing, the Warhawk rolls out straight down the asphalt for about 100 feet.

LOW-SPEED PERFORMANCE

The P-40 is very stable and responsive at low speeds. On induced stalls, the nose slowly dips forward, but neither wingtip drops.

HIGH-SPEED PERFORMANCE

The O.S. .50 engine supplies ample high-speed power. High-speed flight is stable, and surface controls remain responsive.

AEROBATICS

Axial rolls can be performed at a moderate roll rate, and loops are round and fairly tight. While it's inverted, the Warhawk does not require any elevator input to maintain level flight.

The kit contains a prebuilt, all-wood fuselage, wings and tail assemblies, a generous hardware package, an adjustable nylon engine mount, a fuel tank, canopy, cowl, spinner, fixed-wire landing gear, main wheels and tailwheel, strut covers and wheel-well inserts. For added realism, Kyosho also leaves enough room to install 90-degree mechanical rotating retracts as an option. A 15-page, photo-illustrated instruction manual and three sheets of pressure-sensitive adhesive covering film in tan, olive green and light blue complete the package. The extra covering comes in handy during the assembly and for potential future repairs.

ASSEMBLY

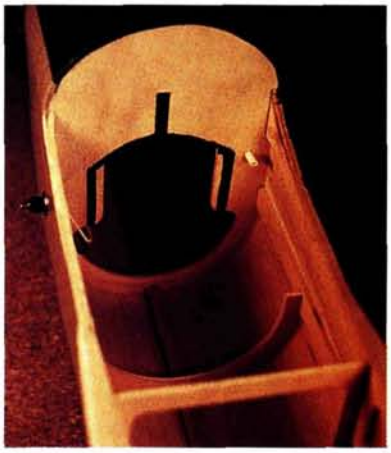
I first compared the contents of the box with the list of materials in the manual to make sure that everything was there. When I was sure the kit was complete, I turned my attention to the covering on the fuselage, wing and tailpieces. There was a fair amount of sag in the covering on most of the surfaces, so I let them sit in the sunshine for an hour or so. Since the Warhawk is covered with pressure-sensitive adhesive film, be sure to press down on all of the seams with your finger. I then tightened the film with a heat gun. Make sure that you do not warp the wings or tail feathers. Don't use a heat-sealing iron on this material; it will remove the colored print and melt the film.

WINGS

The first step is to join the aileron to the wing using thin CA on both sides of each hinge. Remove any excess CA with a paper towel.

Each aileron requires a standard-size servo. To remove the aileron servo hatch, locate the four pinholes that designate each corner of the hatch and carefully cut the covering from one hole to the other. The kit comes with metal clevises to connect the pushrods to the control horns. Just make sure that you file flat spots on the pushrods to secure the setscrews. Thread the servo wires through each wing panel using the provided strings. I added aileron differential throw by making the appropriate adjustments to the servo-output arms.

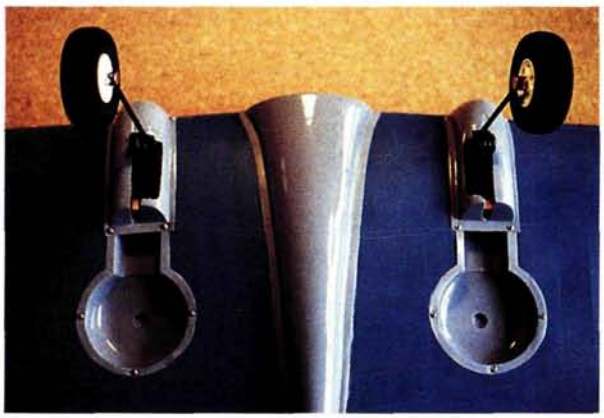
Glue the dihedral brace and wing halves together with 30-minute epoxy. I opted to install Hobbico's 90-degree rotating mechanical retracts. If you choose to do the same, cut an opening in the top center section of the wing to accommodate the retract servo, as shown in the manual. Locate and remove the film from the area where the landing-gear base will be mounted. The instruction manual clearly shows the main wheels mounted on the inboard side of the landing-gear struts, but for improved ground handling, I wanted them on the outboard side; this also achieves a more scale-like appearance. Consequently, to have outboard wheels that retract properly, the retract units must be swapped.



To allow room for the foam padding around the fuel tank, I removed approximately ¼ inch of wood from the sides of the former.

Use the dimensions provided in the illustrated diagram to determine the locations of the wheel wells. Be sure to measure from the center of the retract's pivot pin to the center of each wheel axle. Use the retracted strut as a guide in determining the location of the wheel wells' center point. Kyosho provides two 90-degree bellcranks and the necessary hardware for this step, but you must provide the pushrods and connectors.

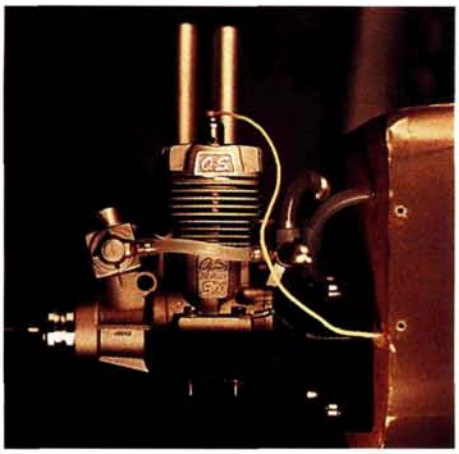
The manual instructs you to CA the wheel-well inserts and strut covers into place, but I opted to use 2x8mm screws instead. This makes the retracts easily removable for future adjustments. I completed the wing assembly by gluing the belly pan into place.



I swapped the locations of the retracts so the main wheels would be on the outboard side of the struts while maintaining proper retract action. This ensures better ground handling.

ENGINE INSTALLATION

I chose to use the new O.S. Max .50 SX Ring 2-stroke engine. I used the supplied engine mount and followed the detailed instructions to temporarily mount the engine in the inverted position. The appropriate centerlines come already marked on the firewall—a nice feature!



The O.S. Max .50 SX provides the Warhawk with plenty of power.

Before I inserted the blind nuts on the rear of the firewall, I coated each side of the firewall with 30-minute epoxy thinned with alcohol (50 percent by volume) and allowed it to cure overnight. This prevents the blind nuts from being pulled through the wood when you tighten the engine mount. I then installed the throttle pushrod, making sure that it would not interfere with the fuel tank. Because the engine would be completely covered by the cowl, I mounted a glow-plug igniter on the right side of the fuselage.

FUEL TANK

When I assembled the fuel tank, I included a third line for filling. Using a hand pump, I applied pressure to the tank and held it underwater in the kitchen sink. Air bubbles exposed a leak in the area where the fuel pick-up tube exits the rubber stopper, but this was easily fixed by tightening the stopper screw.

I wanted the tank to have more protection from vibration other than simply using a silicone bead, as indicated in the manual, so I enlarged the opening in the first former by approximately ¼ inch on the sides, and I wrapped ½-inch-thick foam around the rear section of the fuel tank. The front of the tank protrudes through the hole in the firewall, so I applied silicone sealant generously between the tank and the firewall.

THE COWL

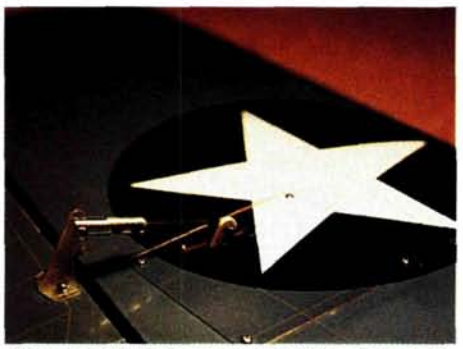
I was concerned about the lack of airflow through the cowl because it completely encloses the engine. I decided to cut open the front air intakes with a Dremel tool and then cut and attach the three flaps on the rear underside of the cowl. I trimmed the cowl to fit over the engine and muffler and drilled some holes to access the carburetor needles. I then cut out the exhaust stacks and glued them into place.

Because of the cowl's compound curves, the shark's-mouth decal was extremely difficult to apply. You need to concentrate on getting the top half of the mouth wrinkle-free, and then cut several vertical slices on the bottom half to bring the decal around the bottom portion of the cowl; this will minimize the wrinkles. I decided not to use the decals included for the eyes; instead, I painted a more menacing eye design.

TAIL ASSEMBLY

The tail assembly is pretty straightforward. Just be sure to align all of the control surfaces. For a more finished look, select the appropriate color from the excess covering materials and cut it into strips. Apply the strips to the areas where the horizontal and vertical stab meet the fuselage.

This close-up of the radio compartment shows the radio gear, remote glow-plug igniter, fuel tank (with foam) and functional rear cowl flaps.



The metal clevis is secured to the pushrod with two setscrews. I positioned the aileron servo-output arm to allow differential throws.

When you cut the slots for the rudder and elevator pushrods, start with a very small opening and enlarge it only as needed. Too large an opening will allow the pushrod to flex when it's actuated.

FINISHING TOUCHES

The last step in the assembly is to attach the canopy. After I trimmed it, I masked it off and sprayed it with Pactra Formula-U flat olive-drab paint to match the fuselage.

Last, I turned the model over and sealed off all the control-surface hinge-line gaps. This is another perfect opportunity to use the excess covering material. If you don't usually bother to perform this step, I advise you to start now. You will discover that sealing the hinge gap dramatically increases the lift.

I was able to balance the model simply by relocating the battery pack, and I adjusted the travel for each control surface using the values listed in the manual.

CONCLUSION

The P-40 Warhawk is a great choice for intermediate and advanced fliers. It's a great-looking, quick-building ARF with very good flight characteristics. The P-40 is now one of my hangar favorites, and I'm proud to own it.

Airtronics *(714) 978-1895; airtronics.net.*

Hobbico; *distributed by Great Planes; hobbico.com.*

Kyosho; *distributed by Great Planes Model Distributors Co. (800) 637-7600; greatplanes.com.*

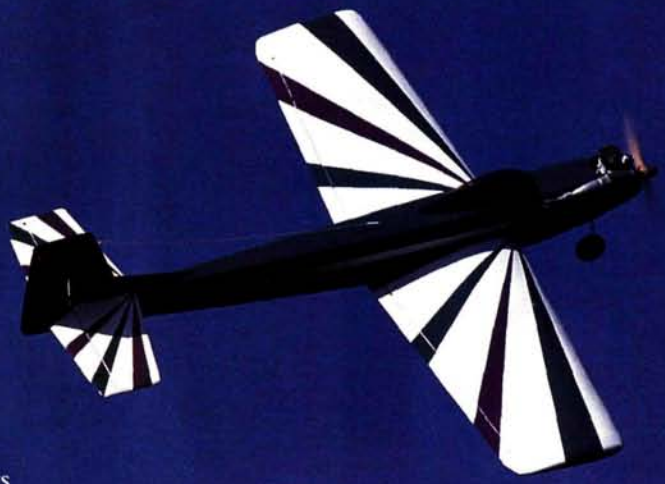
O.S.; *distributed by Great Planes; osengines.com.*

Pactra Inc. *(815) 962-6645.*

Wildcat Fuels *(606) 885-5619; wildcatfuel.com.*

Zinger; *distributed by J&Z Products (310) 539-2313.*

Tanks, tubing & fittings—making it all work!



by the staff of Model Airplane News

RC FUEL S

Flying RC model airplanes that are powered by glow and gasoline engines means that you'll have to install a fuel tank and other necessary fuel-system components. This is easy for experienced builders, but newcomers often find it challenging to choose, assemble and install a proper fuel-delivery system. This article shows the basic makeup of typical fuel systems and how to properly install and maintain them. Whether you want to pilot ½A sport models, speedy pylon racers, or giant-scale warbirds, you have to keep the fuel flowing to the engine. These tips will make all that plumbing more understandable.

THE BASICS

The fuel tank is a container for the engine's supply of fuel. The tank is connected to the engine's carburetor with flexible fuel line (often called fuel tubing), and a rubber stopper seals it. For a tank to operate properly, it must have a vent line that allows air to enter the tank as fuel is drawn out. The vent relieves the vacuum left in the tank. Model airplanes don't always fly straight and level; they climb and dive and often fly inverted. To allow the fuel to flow at different attitudes, the tank has a flexible internal pick-up tube. A heavy fitting (called a "clunk") at the end of the pick-up tube keeps the end of the tube at the lowest part of the tank for a continuous supply of fuel. Lengths of brass tube pass through the tank's stopper, and the flexible fuel lines that carry the fuel to the engine simply slip over the brass tubes. The rest of the fittings and accessories help the fuel system work properly and make it easier to maintain and operate.

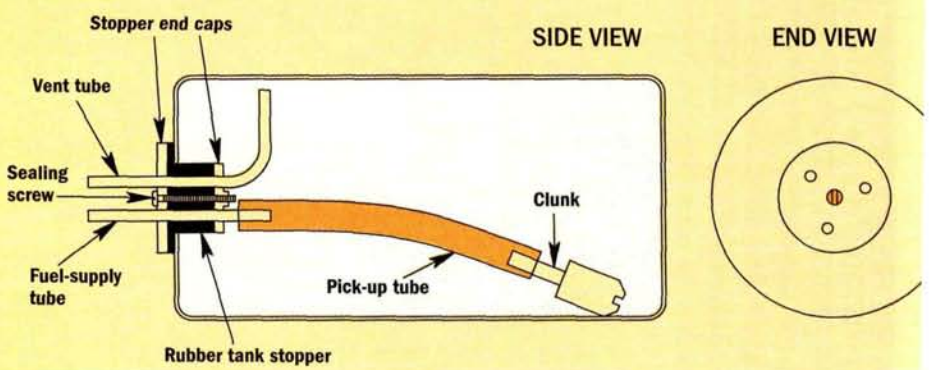
Once you've chosen the correct tank, fuel lines and accessories for your model, you'll be well on your way to having an engine that runs reliably.

FUEL-TANK SETUP

Different types of airplanes have different fuel-system requirements. Most trainers' engines are exposed, and this makes for easy access to the fuel line. A simple two-line setup works well with this arrangement. In scale models where the engine is completely enclosed by a cowl, a three-line system is the way to go. You can avoid many problems if you follow a few simple guidelines such as these:

- For glow engines, always use silicone tubing of the proper inside diameter. Medium tubing works well with .15- to .75-size engines. Use narrow fuel tubing for ½A engines; larger tubing is best for engines larger than .75ci.
- For gasoline engines, use neoprene plastic or special "Tygon"-brand tubing.
- Set up the internal fuel link properly inside the tank. The vent tube must point upward and be as close as possible to the top of the tank. Many tanks have a "bubble" molded at the top; the end of the vent tube should fit into it. The vent tube should extend about ⅜ inch into the tank and then bend 90 degrees upward in a smooth radius without any kinks. A Du-Bro tubing bender works well.
- The vent line can either be exposed (uncapped) or attached to a fitting on the muffler to pressurize the tank.
- The fuel pick-up line inside the tank must move freely and should be just long enough to prevent the clunk from touching the back of the tank.
- Always check for leaks or pinholes in the fuel lines; many fuel-system problems arise when air gets into the lines.
- Whenever possible, install the tank so that its centerline is about ⅜ to ½ inch below the carburetor's spray bar. If the tank is too high, fuel will be siphoned into the engine and will flood it. If the tank is too low, the engine will run leaner as the tank empties.
- Wrap the tank in foam rubber to isolate it from vibration. Vibration can cause the fuel to foam and the engine to run lean. If the neck of the tank is inserted into a hole in the firewall, apply silicone around the neck to protect it from vibration.

FIGURE 1
BASIC FUEL TANK AND PARTS



YSTEMS

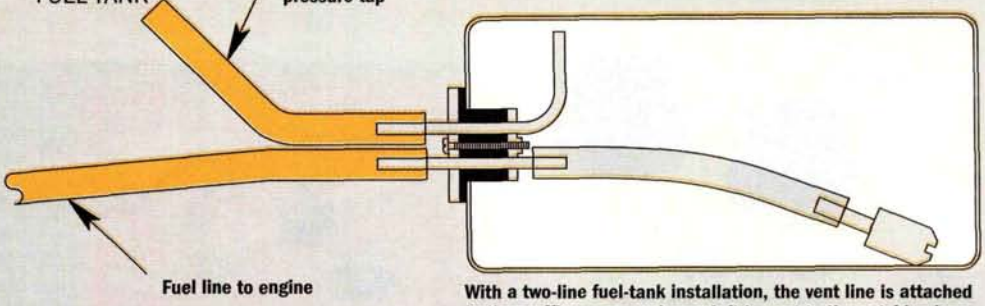
HOW MANY LINES?

■ **TWO-LINE SETUP.** A two-line fuel system is very simple and almost foolproof. To set up the tank, you need only two pieces of brass tube, a clunk, a rubber stopper and a short length of silicone tubing. Bend one tube 90 degrees to form the vent and insert it through the stopper. It lets outside air in as the fuel is drained out, and it acts as an overflow indicator when you fill the tank. The second tube is the fuel-supply tube; the pick-up tube and clunk are attached to it. This line is attached to the carburetor and is also used to fill the tank.

■ **THREE-LINE SETUP.** In a three-line tank, you assemble the tank just as you do a two-line system, but the third line is used to fill the tank. It can be made from a short length of brass tube and doesn't need a pick-up line in the tank; you can also make it like the vent tube, except it is pointed downward. Before you start the engine, you must plug the third line to prevent fuel from leaking out.

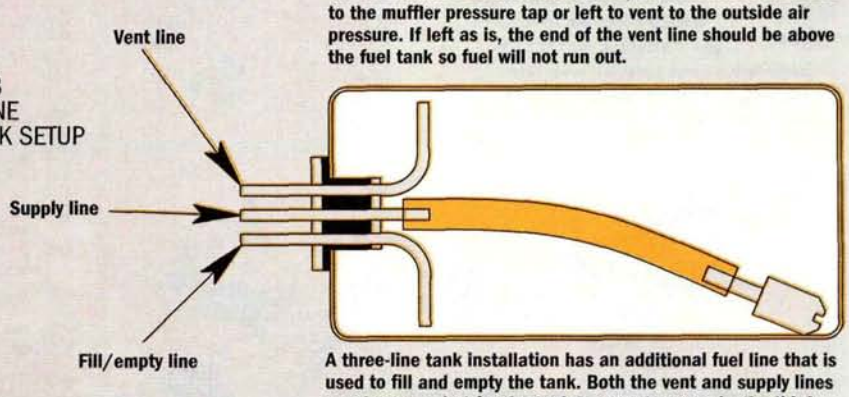
To properly size and fit the brass tubes required in a fuel system, it's handy to have a tube cutter such as this one from K&S Engineering. It's designed to cut soft metals such as brass and aluminum. With the Du-Bro and K&S benders, you can safely make 90-degree bends without kinks or breaks.

FIGURE 2
BASIC TWO-LINE FUEL TANK



With a two-line fuel-tank installation, the vent line is attached to the muffler pressure tap or left to vent to the outside air pressure. If left as is, the end of the vent line should be above the fuel tank so fuel will not run out.

FIGURE 3
THREE-LINE FUEL-TANK SETUP



A three-line tank installation has an additional fuel line that is used to fill and empty the tank. Both the vent and supply lines are the same, but for the tank to operate properly, the third line has to be capped before you start the engine.

SHAPES AND SIZES

Fuel tanks come in various shapes, sizes and styles. Capacities range from 1 to 32 ounces, and shapes include slanted, round, rectangular and oval. Tanks are generally molded of polyethylene because it isn't affected by glow fuel or gasoline. Some tanks, such as Sullivan's Flextanks, can be heated and reshaped to fit into tight spaces. Be sure to use the proper stopper in your tank for the type of fuel you're using. A stopper meant for glow fuel will deteriorate very quickly when it contacts gasoline. If the neck of your tank doesn't fit into a hole in the firewall, use a slanted tank or one that has a "chin" on the front of it. The chin prevents the fuel line from being pinched between the tank and the firewall.

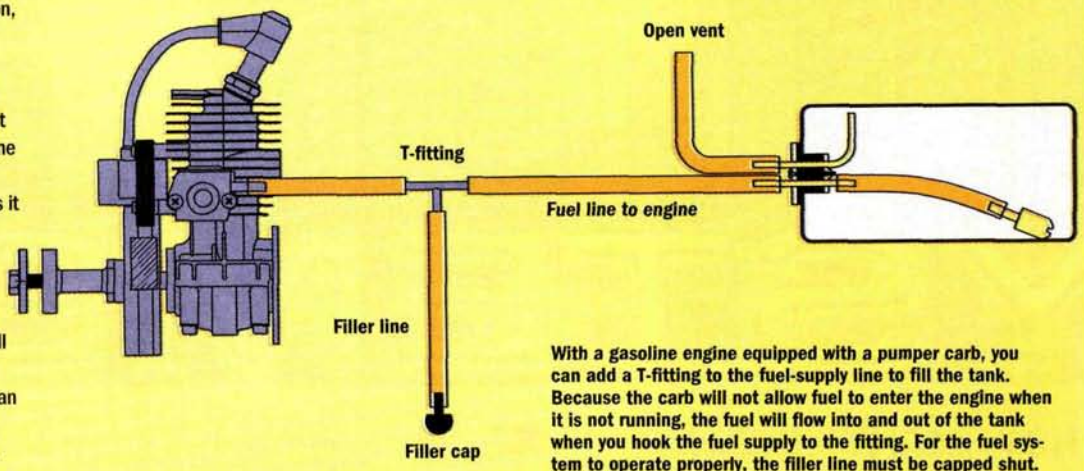
Fuel tanks come in many sizes and shapes. Note the slanted- and chin-style tanks on the end; they prevent the fuel lines from being pinched by the firewall.

GASOLINE FUEL SYSTEMS

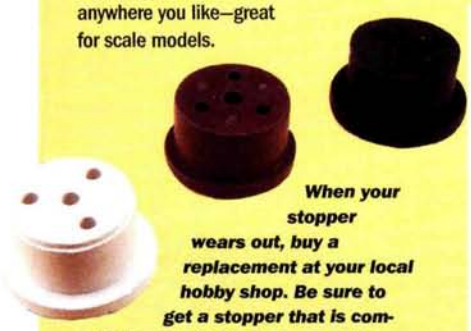
Perhaps the simplest fuel systems are those for gasoline-powered engines. Unlike glow engines, which use a venturi vacuum to draw the fuel into the carb, most gas engines have a pumper carb to draw fuel out of the tank. For this reason, the placement of the gas tank is not nearly as critical as it is for the glow engine. A gas engine can draw the fuel through several inches of tubing without any ill effects. Also, because the gasoline carb has a diaphragm pump, it won't allow fuel to flow into the engine unless it is running.

An easy way to fill and empty the tank is to install a T-fitting in the supply line and add a length of tubing. When you pump fuel into this line, it will flow only into the tank and won't flood the engine. When the tank is full, you can use a plug to seal the fill line, and the engine will draw the fuel from the tank. By adding a long fill line and using a fuel dot fitting, you can place your filler cap anywhere you like—great for scale models.

FIGURE 4
GASOLINE-TANK SETUP



With a gasoline engine equipped with a pumper carb, you can add a T-fitting to the fuel-supply line to fill the tank. Because the carb will not allow fuel to enter the engine when it is not running, the fuel will flow into and out of the tank when you hook the fuel supply to the fitting. For the fuel system to operate properly, the filler line must be capped shut.



When your stopper wears out, buy a replacement at your local hobby shop. Be sure to get a stopper that is compatible with the fuel you use. The brown one in the middle is for use with gasoline engines.

FUEL-SYSTEM ACCESSORIES

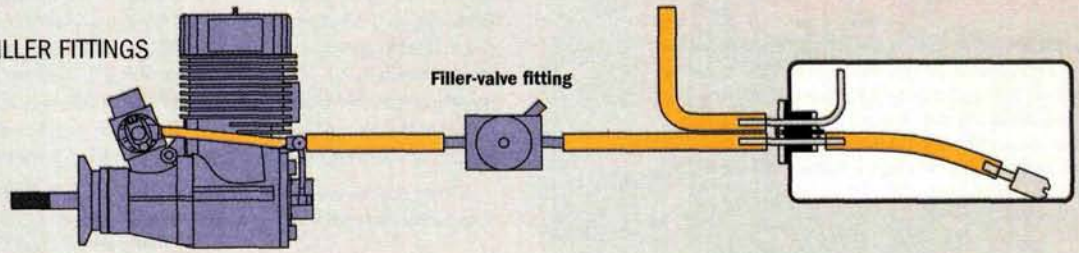
A fuel-filler valve makes it easier to fuel your model; several are available. Used with two-line setups, they allow you to fill or empty the tank without disconnecting the fuel lines. They're easy to install and are simply connected to your supply line like a T-fitting. Most fuel valves consist of a simple check ball design and can be installed on the model wherever it's convenient. Don't attach the filler valve to a removable engine cowl; attach it to the firewall so you can get to it through a hole in the cowl. If you use a three-line system, a fuel dot is a good choice for a tank filler. The dot is attached to the third line; you simply pull it from its retainer, remove the plug and fill your tank. To hold fuel lines securely in place, use retainer clips or an ⅛-inch-wide piece of fuel line slipped over the main line.

Above: fuel-filler valves make it easy to fill the fuel tank. Valves such as these from Sullivan (top) and Du-Bro (bottom) can be installed in a convenient spot on the firewall; just attach the feed line from the tank to the valve and then to the carburetor. The R/C City fuel dot (center) is used in a 3-line fuel system, and it's foolproof. Left: to ensure that your fuel line doesn't accidentally become disconnected during flight, it's a good idea to use a retaining clip or a nylon tie-wrap. The Du-Bro spring clips come in various sizes to accommodate small-, medium- and large-diameter fuel lines. Aerotrend makes neat little clamps that work well on Tygon fuel line. Trinity's nylon ties are a quick and easy way to secure fuel lines.

If you want your engine to run reliably, a fuel filter is an absolute necessity. The large Du-Bro filter is used on large glow or gas engines. The sintered bronze filter (also from Du-Bro) can be used either in the tank as a clunk or in your fuel jug. The smaller Great Planes filter can be placed in the feed line between the tank and carburetor. This filter can also be disassembled and cleaned.

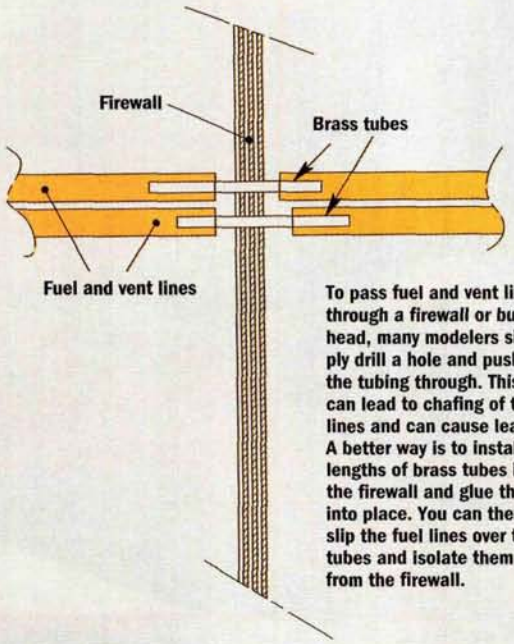
FIGURE 5
TWO-LINE FUEL TANKS WITH FILLER FITTINGS

A filler valve can also be used with a two-line tank setup. When you connect your fuel supply to the valve, it shuts off flow to the engine so the tank is filled or emptied. When the fuel supply is disconnected, the valve permits fuel flow from the tank to the engine.



TROUBLESHOOTING YOUR FUEL SYSTEM

FIGURE 6
FIREWALL PASSAGES



To pass fuel and vent lines through a firewall or bulkhead, many modelers simply drill a hole and push the tubing through. This can lead to chafing of the lines and can cause leaks. A better way is to install lengths of brass tubes in the firewall and glue them into place. You can then slip the fuel lines over the tubes and isolate them from the firewall.

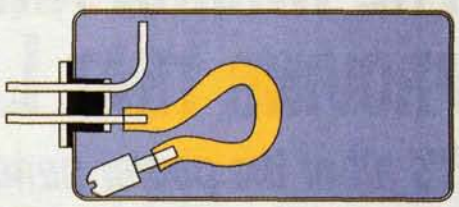
Properly installed, your fuel system will last a very long time and may never need to be changed. In a hard landing, however, some of its parts may be dislodged and stop working. Here are some common fuel-flow problems and fixes.

■ If your engine begins to run lean, check for small pinholes in the fuel-supply line. Check closely wherever there are tight bends in the line, or where it comes into contact with your model. Leaks commonly occur where the lines pass through the firewall. A better method of installation is to drill small holes in the firewall and use lengths of brass tubes in the holes. You can then slip the fuel lines over the brass tubes to complete the system (see figure 6).

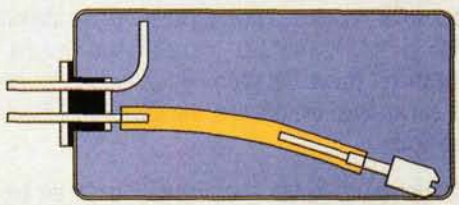
■ After a hard landing, the flexible pick-up tube and clunk inside the fuel tank may be forced all the way forward. This often goes unnoticed until the next flight, when the tank stops delivering fuel to the engine in a nose-high attitude. To prevent this, solder a short piece of brass tube to your clunk. This decreases the pick-up tube's flexibility but still allows it to draw fuel in normal flying attitudes (see figure 7).

■ If your engine begins to run erratically, chances are that some debris has gotten into the fuel system and is blocking the carb. It usually finds its way into the fuel tank from your fuel jug, and if it blocks the fuel flow, your engine will die. The easiest way to prevent this is with an in-line fuel filter. You install it just before the carb in the supply line. You can also install a filter in your fuel-pump line so you fill the tank only with filtered fuel. Add a combination fuel clunk/filter, and you'll have a triple defense against deadsticks.

FIGURE 7
PREVENT YOUR PICK-UP TUBE FROM BENDING



In a sudden stop or a hard landing, the fuel pick-up tube and clunk can be driven forward; this can prevent the tank from delivering all the fuel in the tank.



By soldering a short length of brass tube into the end of the clunk, you can stiffen the pick-up line. This helps prevent the line and clunk from being forced to the front of the tank.

Aerotrend Products (203) 734-0600; aerotrend.com.

Du-Bro (800) 848-9411; dubro.com.

Ernst; distributed by Tower Hobbies (800) 637-6050; towerhobbies.com.

K&S Engineering (773) 586-8503; ksmetals.com.

R/C City Products; distributed by Planes Plus Inc. (630) 904-9983.

Sullivan Products (410) 732-3500; sullivanproducts.com.

Trinity Products Inc. (732) 635-1600; teamtrinity.com.

CONSTRUCTION

L-19 Speed 400 BIRD DOG

A sport-scale Cessna observation plane

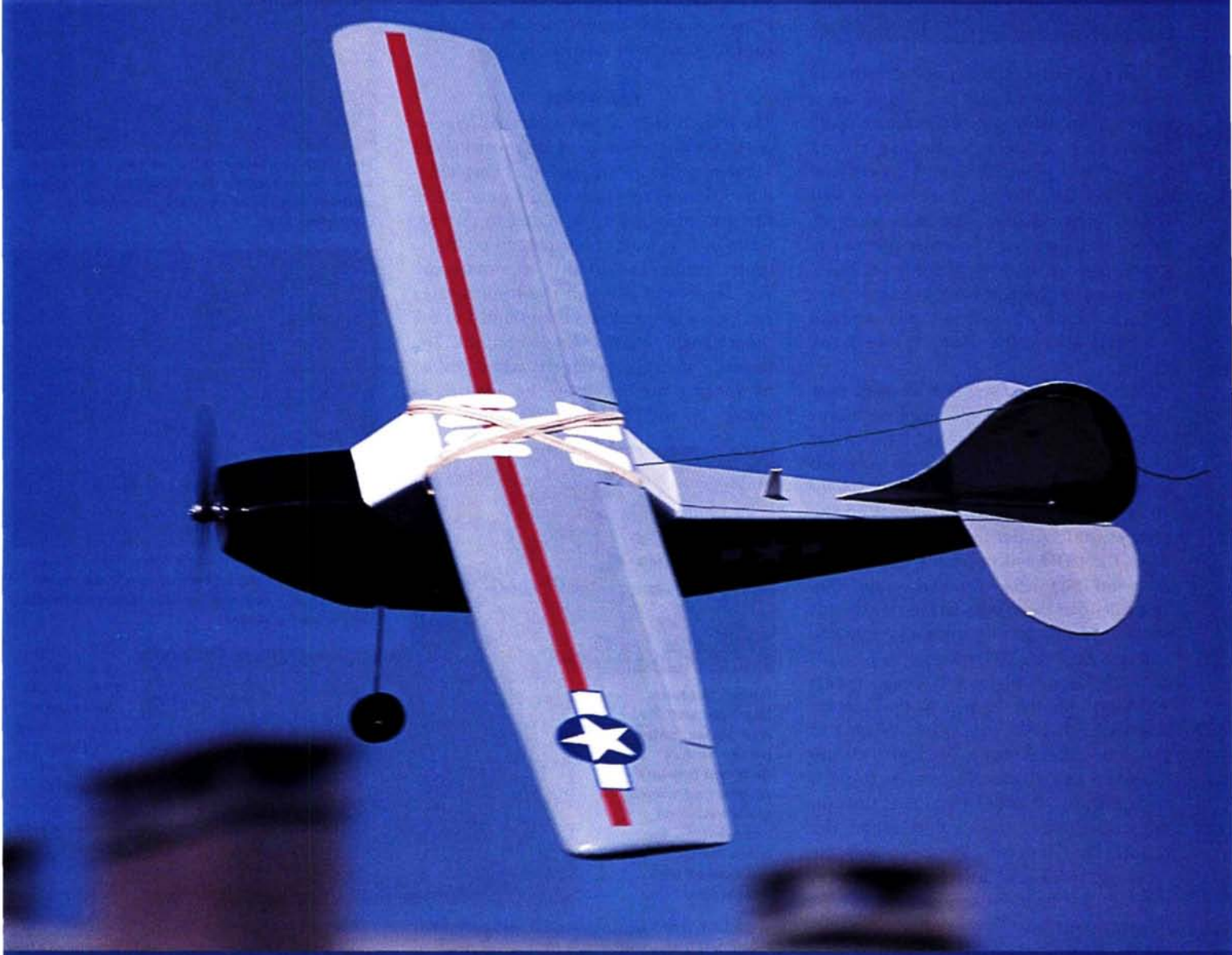
by Tom Fey
with Gus Morfis

The distinctive Cessna L-19 Bird Dog was purposely built as a military liaison and artillery-spotting aircraft. It first flew in December 1949, barely six months before the Korean War began. Blessed with good pilot visibility, simple maintenance requirements, reasonable performance and outstanding flaps for getting into and out of tight places, the Bird Dog served a vital military role. During the Vietnam War, the L-19 became the O-1 and was used as a forward air controller (FAC). Armed with a courageous pilot and white phosphorous ("willy pete") rockets, the O-1 identified targets for the fast-moving F-105s, F-4s and A-4s to attack. The plane and its pilots both proved to be noble, bare-knuckle warriors.

FLYING THE BIRD DOG

With the control movements and CG set as noted on the plan, the O-1 climbs smartly from a flat-footed, medium-strength hand launch. The plane is stable but responsive, with moderate flight speeds—characteristics that are ideal for a trainer. Level flight can be maintained at roughly ½ throttle. The rudder is responsive, so hammerheads are very enjoyable, and loops can be completed from level flight. Stalls are mild and straight-ahead with no tendency to drop a wing or to enter a spin. The suggested aileron throws are good for general flying, but larger throws improve the roll rate. Once power cuts off, the nose drops about 15 degrees, but a little backpressure on the elevator makes for a flat glide. Landing the Dog is very easy, with or without power; however, the small-diameter wheels need a flat (or at least, a very well-groomed) surface to prevent nose-overs.

Note: the O-1 won't maintain altitude in knife-edge or inverted flight. It takes a while to get around a roll, and it slops through snap rolls, but this utilitarian Cessna is not really designed for these tasks.



SPECIFICATIONS

MODEL: L-19 Bird Dog

TYPE: electric-powered sport scale

WINGSPAN: 37.5 in.

WING AREA: 190 sq. in.

WEIGHT: 18.8 oz.

WING LOADING: 14.35 oz./sq. ft.

POWER USED: Speed 400 6V motor

PROP USED: Master Airscrew 6x4

RADIO REQ'D: 4-channel (throttle, rudder, aileron and elevator)

COMMENTS: designed by Gus Morfis and built by Tom Fey, the Speed 400 L-19 is an electric-powered, easy-to-build-and-fly, all-balsa sport-scale observation airplane that can be decorated as a Korean or Vietnam War-era warbird. Weighing less than 19 ounces, the Bird Dog makes a great backyard flyer.

The popularity of Speed 400 aircraft and the soundness of the Bird Dog design were a combination that designer Gus Morfis really embraced. In addition to the jaunty good looks, there is plenty of room for 4-channel operation, and the external battery well makes battery changes fast and uncomplicated. Building the Cessna is pleasantly straightforward, but weight control is essential, so use lightweight balsa to ensure good performance. Except where noted, we used aliphatic glue (Pica Gluit) to build the model.

First, build the fuselage bulkheads over the plan from 1/16-inch sheet and the motor mount from 3/32-inch plywood. The battery floor is a lamination of 1/32-inch plywood over 1/16-inch balsa sheet using thick CA for good coverage without warping. With the plan as your guide, use a felt-tip pen to mark the bulkhead positions, the battery floor and the fuselage doublers on the fuselage sides. For those who haven't made this mistake yet, be sure to make one left side and one right side. Glue the upper gear rail onto the 1/32-inch plywood fuselage doubler and then glue the doubler to the fuselage side with thick CA. Use aliphatic glue to attach the triangle stock, 1/4-inch stock and longerons to the sides. Test fit (don't glue!) bulkhead nos. 2 and 3 into their slots on the fuselage sides. Once you've achieved a good fit and accurate alignment, glue the fuselage sides and bulkheads 2 and 3 together, and let them dry.

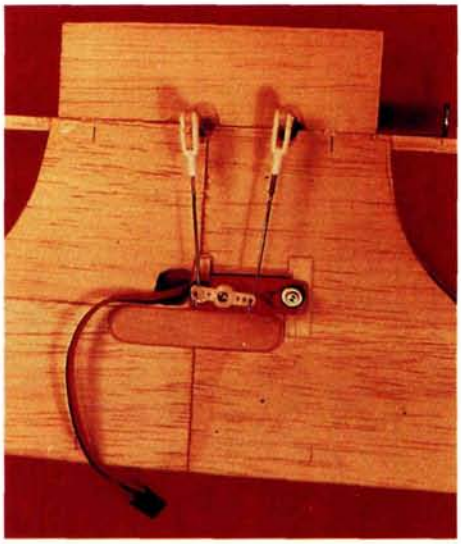
Next, glue the battery floor into place (plywood surface facing down), and then add vertical grain 1/32-inch balsa to the inside of the battery well as shown on the plan. After that, epoxy the motor mount into the nose and glue bulkheads 4 and 5 into place. Leave an 1/8-inch gap at the fuselage end, as it will later accept the rudder tail post. We used two balsa rails mounted across the fuselage to hold the rudder and elevator servos. Install your elevator and rudder-control pushrods and then sheet the upper and lower fuselage surfaces with cross-grain balsa sheet.

Bend the landing gear from 3/32-inch-diameter music wire, and use steel wire to "sew" it to the 3/32-inch plywood gear mount. We used Dave Brown 1½-inch foam wheels shimmed with aluminum tubes to mate the wheels to the wire axles. The gear will later be epoxied onto the upper rails and secured by gluing in the lower plywood rails; this is almost the final step after the fuselage has been covered with MonoKote. Build the tail feathers from 1/8-inch sheet and square stick stock. We used MonoKote hinges on all the control surfaces and made control horns from 1/16-inch plywood.

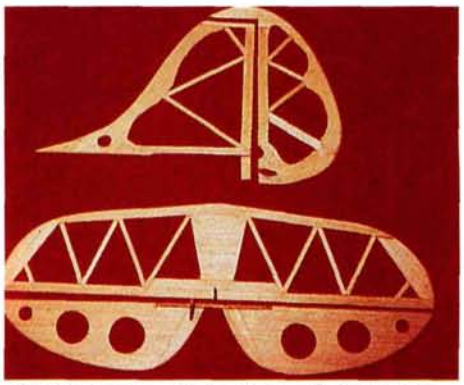
THE WINGS

The wing is built in two panels, so remember to tilt the center rib of each panel about 1½ degrees to incorporate the wing dihedral. The trailing edges of the outer three ribs are shimmed up as noted to provide washout. The wing is constant chord in the center section, but it tapers after mid-span. We simply cut through the leading-edge stock on a diagonal and then sanded in the proper angle to get a close, strong fit. The taper for the trailing edge is accomplished by varying the chord on the ailerons as shown on the plan. The forward section ahead of the spars is sheeted with 1/32-inch balsa. We used some 1/8-inch-square stock to fatten the upper perimeter of the fifth rib where the wing chord starts to taper; this provides a solid area to butt-join the upper wing sheeting.

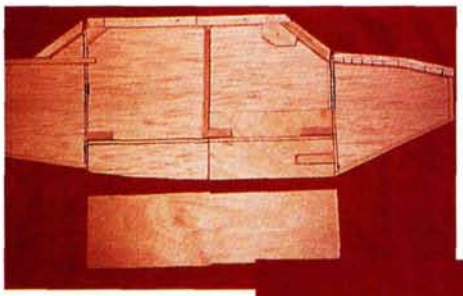
The lightweight tailwheel assembly can be made from an aluminum or plastic disc, glued (with thick CA and a little baking soda) into a notched piece of Sullivan Nyrod. Paint the whole thing black, and glue it into a soft balsa block in the lower tail section.



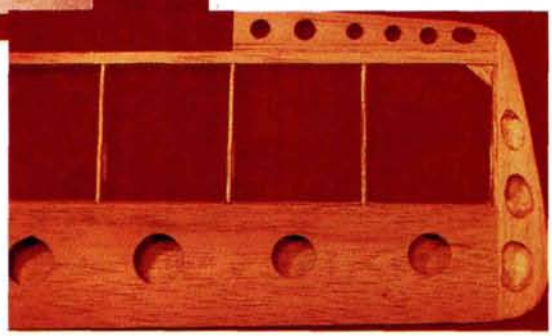
The elevator servo is offset to one side to preserve the centerline ribs' integrity. The 1/32-inch plywood strap reinforces the main spar's centerline joint.



The tail feathers are made from 1/8-inch balsa sticks and sheet; the control horns are made from 1/16-inch plywood epoxied into slots in the rudder and elevator.



Completed fuselage side with 1/32-inch ply laminate for the battery floor and fuselage doubler and triangle stock to accept battery floor. The bulkhead positions are marked with felt-tip pen.

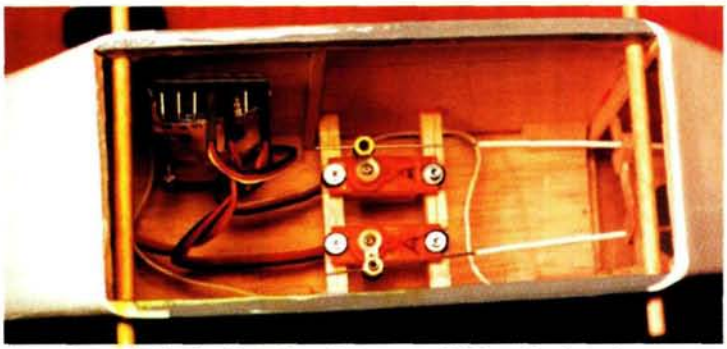


To minimize flying weight, the wingtip block, trailing edge and lower wing skins have lightening holes cut into them.

Attach a strip of self-adhesive hook-and-loop fastener to the plywood surface of the battery floor to secure the battery pack in place. We've never had a battery pack leave the plane during flight, but for those who worry, a well-insulated twist-tie looped through the plywood battery floor can be used as a backup to hold the pack in place.

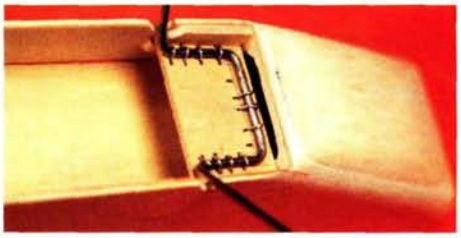
FINAL ASSEMBLY

There are any number of foreign and U.S. military paint schemes for the Bird Dog, but for simplicity, we chose a basic gray scheme



Lots of room in the fuselage. I used Kavan no. 0623 pushrods and MPI MX-50 servos.

A 1000mAh NiMH battery pack secured in place in the battery well. Either flat or 4-over-3 packs can be used.



The landing gear is sewn to the plywood mount with steel wire. The mount is seated on the upper gear rail, then trapped by the lower plywood rails.

used by Raven FACs flying in Laos in 1970, with some stars and bars added. The entire airframe, including white windows, red stripe and black cowling, is covered in MonoKote. We painted the battery well with a matching gray acrylic paint (Hobby Color no. 307).

For power, we used a Graupner 6V Speed 400 motor, a 6x4 Master Airscrew prop and 7, 575mAh Ni-Cds or 1000mAh NiMH cells. Three MPI MX-50 servos, a caseless Airtronics receiver and a Castle Creations Pixie 14 speed controller completed the flight gear. Ready to fly, the Bird Dog weighs 18.8 ounces.

As a simple-to-build, simple-to-fly, 4-channel electric sport-scale trainer, the Morfis-designed Speed 400 Bird Dog truly excels. So build up a Bird Dog and send the editors a few pictures of your handiwork for all to enjoy.

Speed 400 L-19 Bird Dog

FSP0802B

Designed by Gus Morfis and built by Tom Fey, the Speed 400 L-19 is an electric-powered, easy-to-build-and-fly, all-balsa sport-scale observation airplane that can be decorated as a Korean or Vietnam War-era warbird. Weighing less than 19 ounces, the Bird Dog makes a great backyard flyer.
WS: 37.5 in.; power: Speed 400 6V electric motor; radio: 4-channel; 1 sheet; LD 2. **$14.95.**

Airtronics *(714) 978-1895; airtronics.net.*

Castle Creations *(913) 438-6325; castlerc.com.*

Dave Brown Products *(513) 738-1576; dbproducts.com.*

Graupner; *distributed by Hobby Lobby Intl.; graupner.com.*

Hobby Lobby Intl. *(615) 373-1444; hobby-lobby.com.*

Kavan; *distributed by Hobby Lobby Intl.*

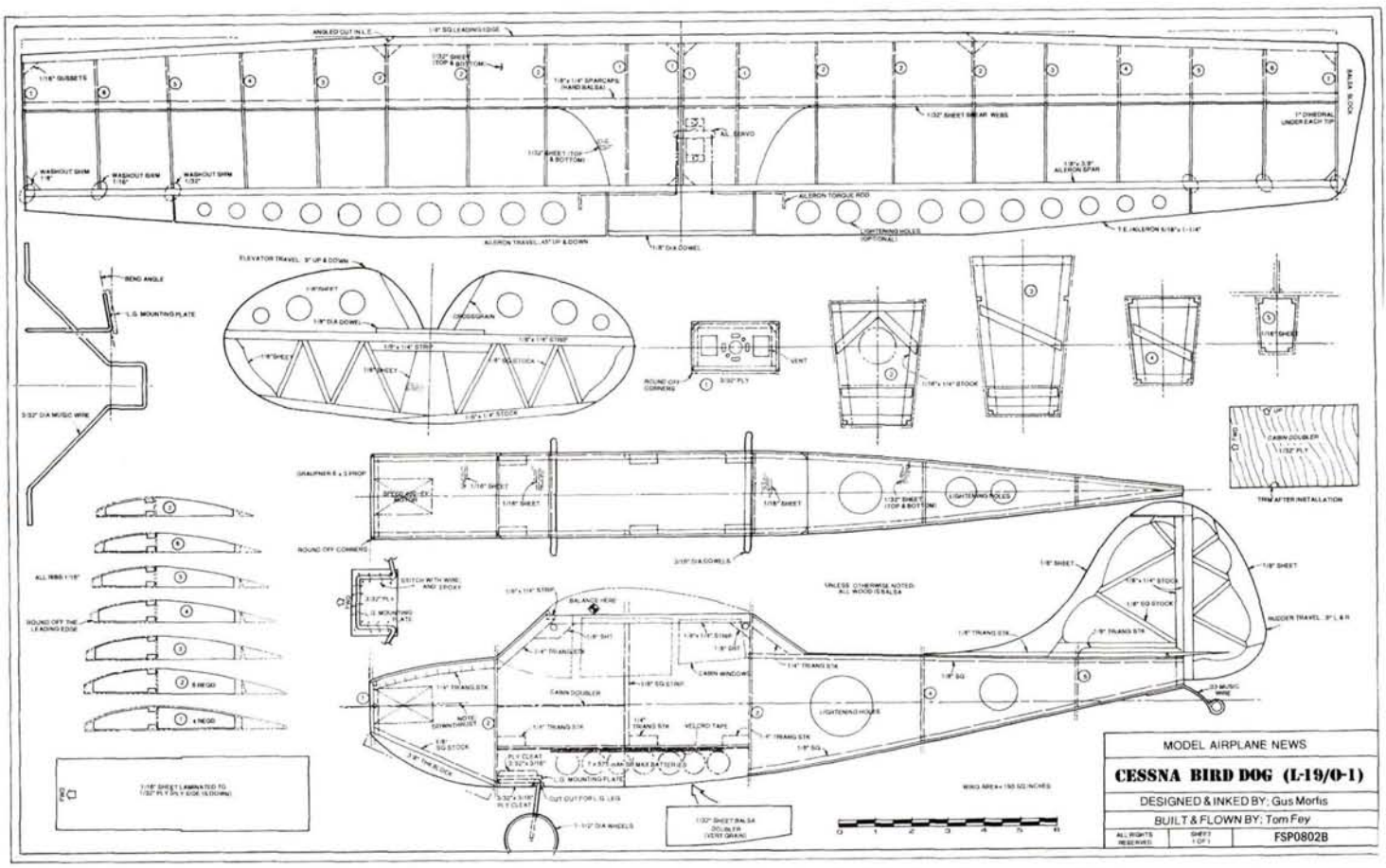
Master Airscrew; *distributed by Windsor Propeller Co. (916) 631-8385; masterairscrew.com.*

MonoKote; *distributed by Great Planes Model Distributors Co. (800) 637-7660; greatplanes.com.*

MPI (Maxx Products Intl.) *(800) 416-6299; maxxprod.com.*

Pica Enterprises Inc. *(305) 935-1436.*

Sullivan Products *(410) 732-3500; sullivanproducts.com.*



To order the full-size plan, turn to "RC Store.com" on page 146.

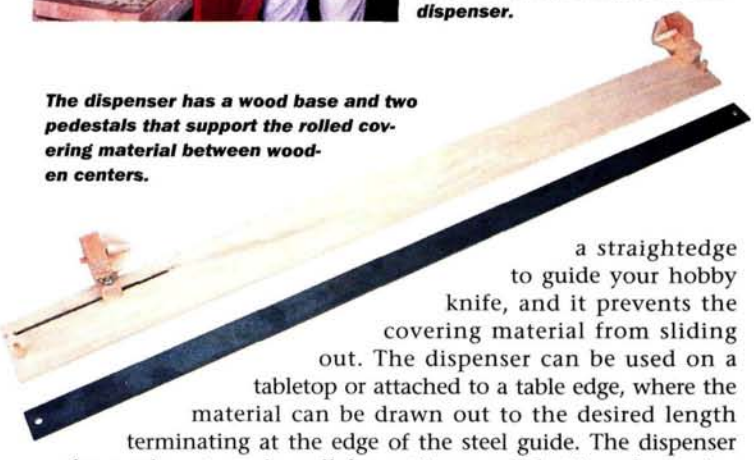
Build a covering-film dispenser

Cutting sheet materials couldn't be easier

by Joe Beshar

This easy-to-make, rolled-film and paper dispenser makes short work of cutting sections off a roll of covering material. All the materials you'll need can be found at any home-improvement store.

Longtime contributor and all-around nice guy Joe Beshar cuts a section of MonoKote off a roll using his handy-dandy rolled-film dispenser.



The dispenser has a wood base and two pedestals that support the rolled covering material between wooden centers.

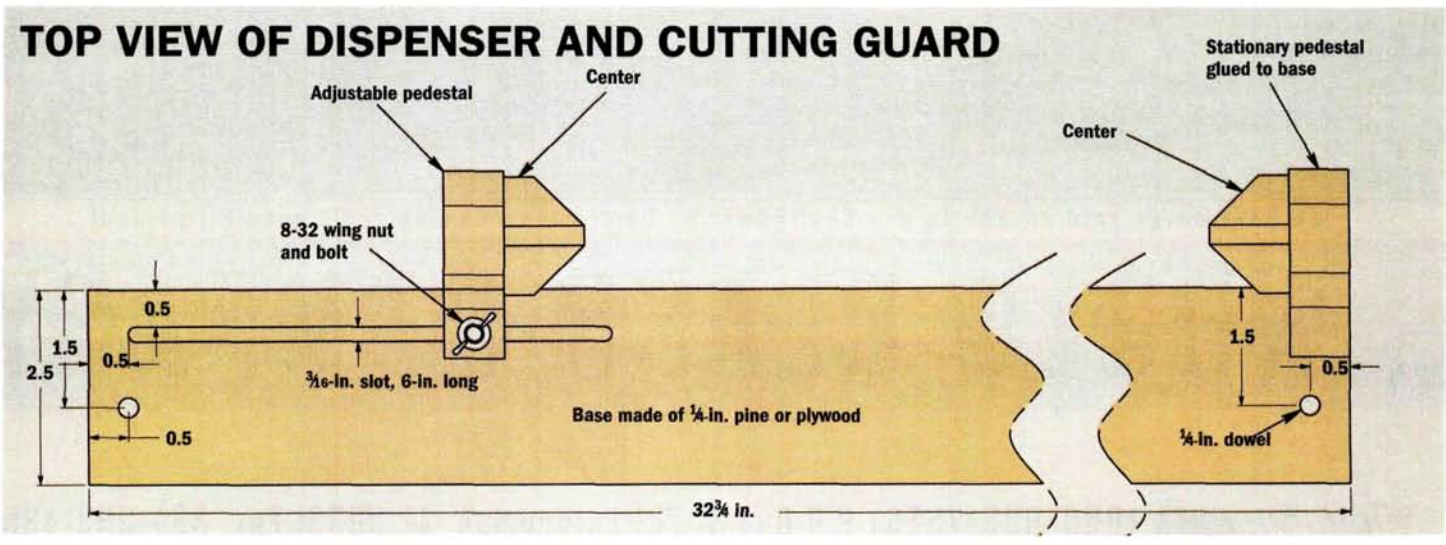
It has always been a hassle for me to unroll plastic coverings such as MonoKote and UltraCote to the size I needed to cut. I wanted an easy way to mark and then cut off the material I needed without using a large, open tabletop. Since my shop worktable is always cluttered with tools, wood, odds and ends and model plans, this aggravation inspired me to design this dispenser/cutter. I also found it very useful when cutting paper for masking models as well. The dispenser/cutter allows easy and accurate cutting of plastic covering film, fabric and paper up to 30 inches wide. Anyone with basic modeling skills and a few hand tools can make this cutter with a minimum of effort. Once you've used it, you'll wonder how you ever got along without it!

The dispenser consists of a slotted base, two pedestal centers, one stationary pedestal and a movable pedestal (adjustable to the length of a covering-film tube). The covering roll fits between the centers, and the movable pedestal slides up against the end of the roll to hold it in place. A wing nut makes locking the pedestal into position a quick, one-handed operation.

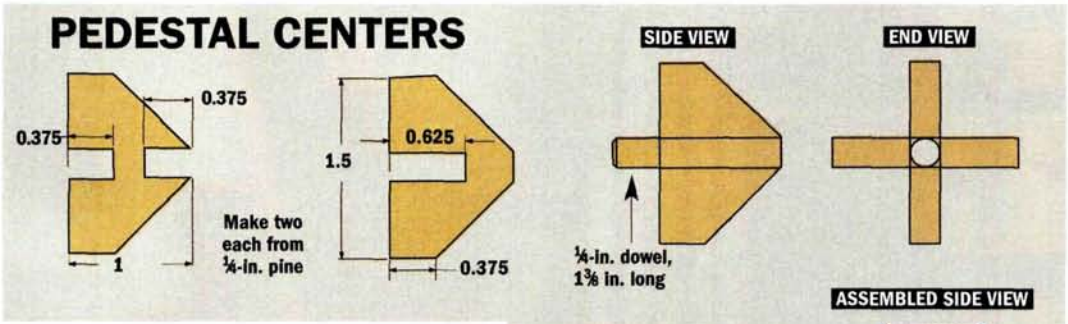
Two vertical dowels hold the steel guide in place over the covering film so you can measure and cut the material. It provides a straightedge to guide your hobby knife, and it prevents the covering material from sliding out. The dispenser can be used on a tabletop or attached to a table edge, where the material can be drawn out to the desired length terminating at the edge of the steel guide. The dispenser also works extremely well for cutting parallel strips of covering material for trimming your model.

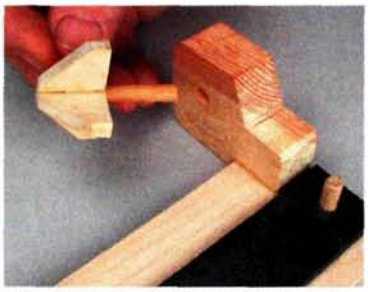
CONSTRUCTION

I made my base from a ¼-inch-thick piece of wood that's about 2½ inches wide and 32¾ inches long, but you could also use a strip of plywood. Drill two ¼-inch holes in the ends of the base for the guide-alignment dowels. The slot for the right pedestal is



The centers are made from ¼-inch-thick wood, cut to shape and glued to the length of the dowel.





The right pedestal is fixed into place and simply glued to the base.

To fit various roll lengths, slide the adjustable pedestal back and forth along the slot.

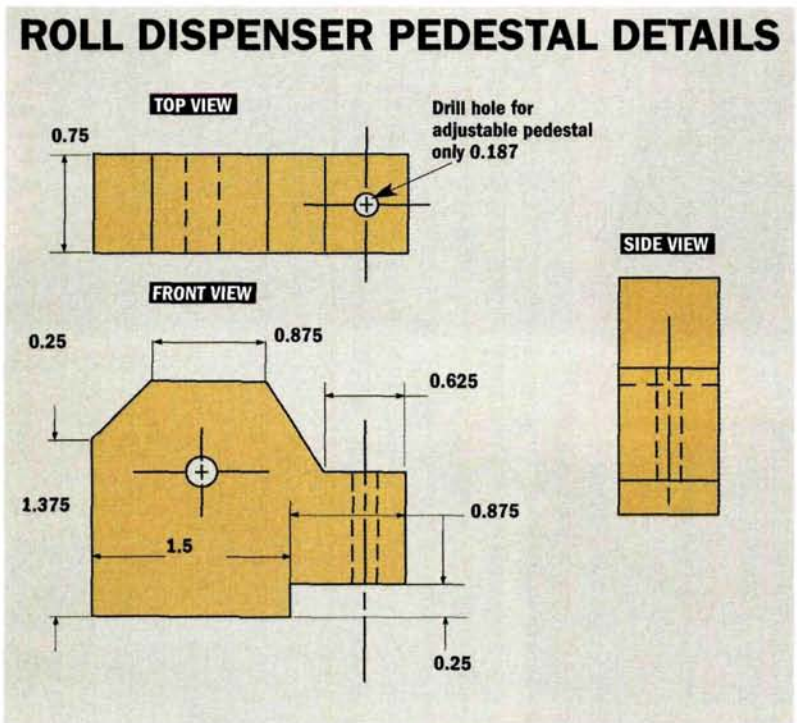
The metal cutting guide allows quick, clean cuts every time!

3⁄16 inch wide by 6 inches long. Drill two 3⁄16-inch holes 6 inches apart and then remove the wood between them to make the slot as shown on the plan. Take your time and make it neat. The left pedestal is glued into place.

The cutter guide is made from an ⅛x1-inch steel plate that's 32¾ inches long (Home Depot item no. 30699439904). Drill two ¼-inch holes in its ends to match the alignment dowels in the base.

PEDESTALS

The two pedestals are made from ¾-inch-thick pine as shown on the plan. Note that one pedestal has a 3⁄16-inch hole drilled through it to accept the locking screw. The two centers are made from ¼-inch-thick wood cut as shown on the plan and then assembled and glued around a 1⅜-inch-long, ¼-inch-diameter dowel.



ASSEMBLY

Glue the stationary pedestal into place and insert the centers into the horizontal holes in each pedestal, making sure they turn freely. If necessary, you can lubricate the holes with petroleum jelly. Attach the adjustable pedestal to the base with a 1½-inch-long 8-32 machine screw inserted into the slot, and secure it with two washers and a wing nut.

To use the dispenser, place a roll of covering material against the stationary pedestal and slide the adjustable one up against the other side of the roll. Tighten the wing nut so the roll is held securely in place, and slide the film under the cutting guide. Unroll however much film you want, and then slide your knife against the guard and make a nice, clean, straight cut. That's it!

Enjoy using your new dispenser. I have found cutting against the wood base to be satisfactory. If, in time, you find that the base has become grooved and worn to a point at which it affects operation, it can easily be replaced.

Good luck, and happy landings.

Engine questions and answers

Keeping our engines running smoothly is a top concern, and readers often comment that they learn a lot by reading engine questions and answers. So it's back to the mailbag this month to continue a discussion of how 2-stroke engines can "4-stroke," discover a fuel-delivery fix and find out how best to tune your engine in hot and cold conditions. If you have a question you'd like to see answered here, please email me at man@airage.com or write to me c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

MORE ON "4-STROKING" 2-STROKES

Michael Jansen emailed, "In the November 2000 issue of *Model Airplane News*, you addressed the issue of 2-stroke cycle engines being able to 4-stroke (fire every other revolution of the crankshaft). Although you gave a compelling explanation of 4-stroking, there has since been considerable commentary in Internet chat rooms from individuals with an opposing opinion: 2-stroke engines can't—and don't—4-stroke.

Figure 1. Pressure vs. time with engine peaked (JP-8 fuel); one combustion event during each revolution of the crank.

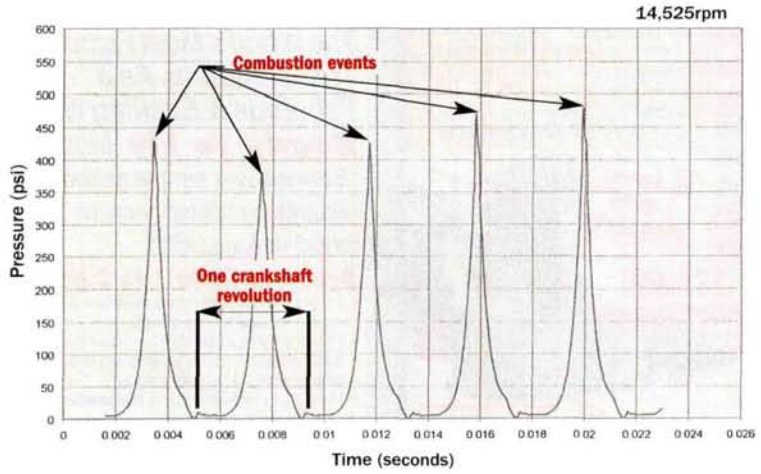
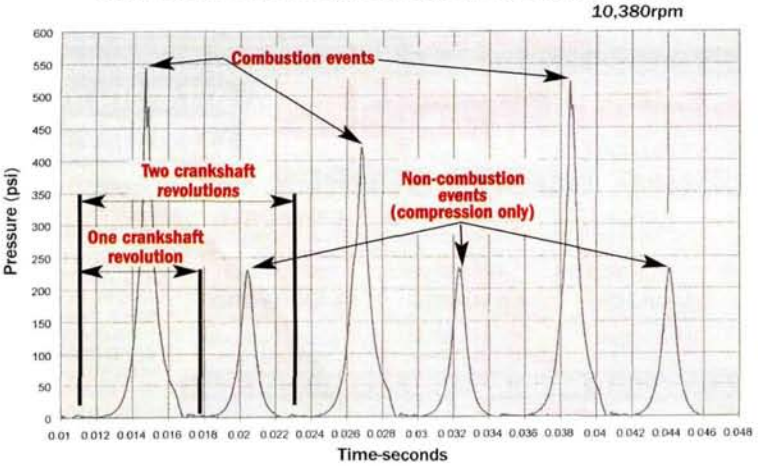


Figure 2. Pressure vs. time during four stroking (JP-8 fuel)



"Many of these proponents point to Figure 2 in your article [shown here], which shows the so-called 'non-firing strokes' (D) to have a very high pressure (almost 250psi). The consensus is that these are, indeed, firing operations and not merely compression events. In the spirit of determining the truth, would you care to comment?"

Michael, I thought that the issue of 4-stroking 2-stroke engines had been put to rest; I guess not! I have asked my friend and partner in experimentation, Franklin Vassallo, to respond to the critics. Frank is a retired professional engineer with extensive experience in thermodynamics and is eminently qualified to discuss these matters. He says:

PEAK CHAMBER PRESSURES

"The major question appears to be related to the peak chamber pressures indicated during the non-combustion events. There are some who believe these indicated pressures are significantly higher than would be expected by simple compression of unburned gases. In fact, one individual has suggested that the indicated pressures of the figure are well over *twice* the pressure that an engine produces while being motored, as with a starter. Unfortunately, he presents no data to back up that suggestion. Dave and I have, in fact, actually measured chamber pressures during motoring in the previously mentioned experiments and have found them to be virtually the same as those indicated during the non-combustion events.

"A comparison of the pressures of Figure 2 (D) and the 'Motoring Graph' (Figure 3) clearly shows that peak chamber pressures of about 230psi are indicated in both instances. Furthermore, such pressure levels during simple compression are in accord with theory. Note that the pressure increase during compression of a gas is the result of two phenomena: first, reduction of volume, which compacts the gas molecules into a smaller space; and second, temperature increase as a result of external work being done on the gas, resulting in greater molecular activity. These combined effects are represented by the thermodynamic relationship:

$$Pmax = Po \times (C)^{1.4}$$

in which
Pmax is the final absolute pressure (for air);
Po is the initial absolute pressure; and
C is the volumetric compression ratio.

"The exponent $^{1.4}$ (for air) accounts for the influences of both volume changes and work. In a 2-stroke engine with an effective compression ratio of 8 (about that of our Enya .61 engine), computations give:

$$Pmax = 14.7 \times (8)^{1.4} = 270psi \text{ (in absolute units)}$$

Here, the value 14.7 is the *absolute* initial atmospheric pressure of the air before compression. The maximum pressure is computed to be 270psi, or 270 - 14.7 = 255psi (in gauge units), or roughly 10 percent *higher* than that actually measured. Hence, the measured pressure during the

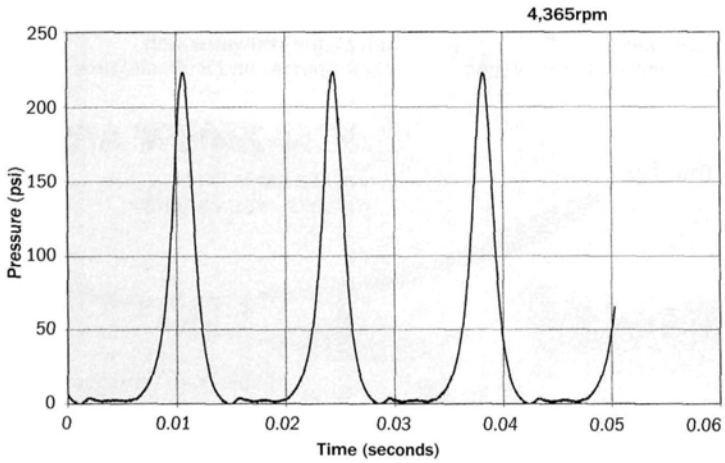
non-combustion events is *not* higher than would be expected.

"Four-stroking is further confirmed by the data of Figures 1 and 2 of Dave's article. These figures show that the rpm of the peaked engine is 14,525, whereas that of the 4-stroking engine is 10,380rpm. Since the same propeller was used for both conditions, and we know that engine power is proportional to the *cube* of the rpm, the ratio of power during 4-stroking to that during peaked operation is:

$$\text{Power ratio} = (10{,}380 \div 14525)^3 = 0.365$$

Thus, the power during 4-stroking is only about 36 percent of the peak power, based on propeller rpm.

Figure 3. Measured chamber pressure during motoring



"The power of an engine is given by the work (foot-pound) per stroke multiplied by the number of power strokes per second. Assuming that the non-firing strokes contribute no work, there are only half as many work strokes per cycle compared with when the engine is operating at peak power. Thus, the ratio of power levels 4-stroking to peaked is:

$$\text{Ratio} = \frac{\text{N} \div 2 \times \text{rps (4-stroking)}}{\text{N} \times \text{rps (peaked)}}$$

$$\text{Ratio} = \frac{\text{rps (4-stroking)}}{2 \times \text{rps (peaked)}}$$

$$\text{Ratio} = \frac{10{,}380 \div 60}{2 \times [14{,}525 \div 60]}$$

$$= 10{,}380 \div 2{,}9050$$

$$= 0.357$$

Again, the power during 4-stroking is about 36 percent of the peak power based on the number of work strokes. Hence, the non-firing strokes contribute no work, and the engine is, therefore, 4-stroking."

Thanks for the elegant analysis of the 4-stroking question, Frank! Let's hope that this settles the question.

FUEL-FLOW FIX

Ajay Podar of Bombay, India, wrote, "I have a new .91 O.S. Max engine that I run with a 13x9.5 MK pattern prop and my own mixed fuel (20-percent castor oil, 15-percent nitro and 65-percent methanol). Although the engine runs fine while flying upright and inverted in a straight line, the problem is that the engine cuts out either after completing a loop or after idling for more than 45 seconds in the air. I am using a standard O.S. muffler, Du-Bro medium fuel tubing and a 500cc tank with a tank centerline ¼ inch below the carburetor centerline and 1½ inches behind the engine. The engine isn't cowled, and I run it a little rich. Do I need to reduce the oil content to 16 percent, increase the fuel tubing size to large and add a one-way valve in the pressure line as I do for my YS 1.40L engine?"

Ajay, the problem with your setup seems to be in the fuel-delivery system. The medium-size fuel line should be OK for a .91 engine, but there's no harm in trying the larger one. Your tank setup sounds fine; I'm assuming that you've checked for leaks from the end of the pick-up tube (inside the tank) to the inlet fitting on the carburetor. Brass tube occasionally splits after a while; after the fuel level drops, this can cause a lean condition.

Running the engine slightly rich at wide-open throttle is always a good idea. You *don't* want to reduce the oil content to 16 percent! Although I don't believe it has anything to do with your problem (unless the piston and cylinder are badly varnished), I would consider reducing the castor-oil content in your lubrication package to 4 percent, with the remaining 16 percent devoted to a good synthetic such as Klotz KL 200, available from motorcycle shops. If Klotz synthetic isn't available, stick with castor oil (make sure this is the degummed variety, or your engine will become varnished very quickly). Castor oil is a great lube, but even the best grade requires you to clean the engine's internals (piston and cylinder) from time to time. If you're getting 45 seconds of reliable in-air idle, you're doing well!

From experience, I believe you need a Perry pump to assist with fuel delivery during high-load maneuvers. The unit works in conjunction with crankcase pressure by operating a diaphragm pump that works in series with a pressure-regulating diaphragm. Output pressure is controlled by an adjustment screw at the rear of the unit. The fuel-metering 2-needle carburetor on your Max .91 completes the adjustment sequence as described in the pump instructions.

Many have found this device to be the answer to their fuel-delivery problems over the past 30 years. The pump sells for about $37.

HOT AND COLD

Joe Bolden emailed, "When the weather gets warmer, you normally have to open the needle valve due to the temperature. When the weather is colder, do you run leaner because the air is 'heavier'? This is a subject for discussion at our flying site. Here in northern Idaho, we fly year-round, even in the snow."

Joe, the idea of opening the needle valve as the temperature increases is backward. If the goal is to produce peak engine rpm (power) for a given air temperature, the primary needle valve must be adjusted in the following manner: lean the needle valve (reduce fuel flow) when the ambient (surrounding) air temperature increases; and conversely, richen the needle valve (increase fuel flow) when air temperature decreases. Although the explanation for this phenomenon is a bit lengthy, here's what happens:

When a non-contained gas such as atmospheric air is cooled,

Figure 4. Richening the mixture.

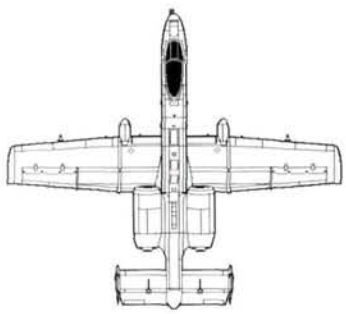
its *density* increases. The opposite is true when it's heated. For our purposes, density may be defined as the quantity of material occupying a given space. The density of heated or cooled air changes due to the *relative motion* of nitrogen, oxygen and water-vapor molecules—most of what air is made of. Increased motion pushes the molecules farther apart; reduced motion moves them closer together. Increased density means more oxygen is available to the engine. For engines, the most important component of the air is oxygen. When mixed with fuel molecules, oxygen produces power after ignition and combustion. In terms of engine power, cool air is good, and hot air is bad.

The term "heavy air" is often used by modelers referring to hot, humid, summertime air. This has more to do with the physiological effects than with engine performance, which is relatively poor under these conditions. Your reference to wintertime "heavy air" corresponds to high-oxygen-density air.

Atmospheric pressure and humidity also have an effect on needle-valve settings and engine performance, but that's a story for another time. ✈

***Enya**; distributed by Altech/MRC (732) 225-6360; modelrec.com.*

***Perry**; distributed by Conley Precision (630) 858-3160; perrypumps.com.*



MRC SUPER BRAIN

The only charger you'll ever need

by Bob Aberle

Decades of electronic expertise have gone into the development and production of MRC's battery chargers. The company's latest model, the Super Brain 959, is a highly sophisticated delta-peak-detect charger with special patented microprocessor circuitry. Attractively priced at under $70, this state-of-the-art unit will be welcome news for RC airplane, boat and car enthusiasts.

The 959 can be powered by either 115 volts of AC house current or by a 12V DC (car) battery, and it can charge 3- to 8-cell Ni-Cd or NiMH battery packs. When used with an optional adapter (available free from MRC), it can also charge a single cell, such as those used with glow drivers.

You can select seven discrete charge currents: 0.5, 1, 1.5, 3, 3.5, 4 and 4.5 amps. Realistically, this range of currents will allow you to charge battery cells with capacities of from 150mAh up to approximately 3,000mAh. In addition, you can select six different delta-peak-voltage thresholds to tailor the cut-off point for specific cell types (no worries about premature peak detection). A 1½x⅝-inch LCD screen shows you five important pieces of information: battery status (a small icon indicates the amount of charge in the battery pack), battery voltage (V) while under charge, charge current (A), charging time (in minutes) and delta-peak-voltage threshold in millivolts (mV).

The 959 is very compact, so it's easy to transport. Three sets of cables exit the plastic case. A 60-inch zip cord provides 115 volts of AC power to operate the charger at home or during indoor flying. An 18-inch cable terminating in two alligator clips is intended to draw power from a 12V DC battery. The 12-inch-long output lead to the battery being charged terminates in a Tamiya-type connector. It is quite easy to make an adapter with the mating half of the Tamiya on one end

SPECIFICATIONS

PRODUCT: Super Brain 959 battery charger

MANUFACTURER: MRC

TYPE: peak-detect charger for 3- to 8-cell Ni-Cd or NiMH packs (w/optional adapter, can also charge a single cell)

INPUT: 115 volts AC or 12 volts DC

INPUT CABLES: 60-in. zip cord for AC and 18-in. cable with alligator clips for DC power

OUTPUT CONNECTION: 12-in. cable terminating with a Tamiya connector

CELL CAPACITY: roughly 150 to 3,000mAh

CHARGE CURRENT: 7 discrete settings from 0.5 to 4.5 amps

PRICE: $69.98

FEATURES: AC/DC input; seven selectable charge currents; six delta-peak-voltage thresholds; LCD screen.

COMMENTS: patented microprocessor circuit allows you to select several peak-detect-voltage threshold points, to tailor the charger to a wide variety of batteries.

HITS
- Selectable peak-detect-voltage thresholds.
- Choice of AC or DC input power.
- Easy to use.
- Reliable and repeatable performance.

MISSES
- Display reading reverts to voltage.
- No cooling fan.

SELECTING CHARGE CURRENT

BATTERY CAPACITY (MAH)	CHARGE CURRENT (A)
Ni-Cd (@3C rate, nominal 20 minutes)	
150 to 200	0.5
300 to 400	1
400 to 600	1.5
900 to 1,100	3 (default)
1,100 to 1,300	3.5
1,300 to 1,400	4
1,400 to 1,600	4.5
NiMH (@2C rate, nominal 30 minutes)	
200 to 300	0.5
400 to 600	1
600 to 800	1.5
1,400 to 1,600	3 (default)
1,600 to 1,800	3.5
1,900 to 1,500	4
2,100 to 3,000	4.5

and your choice of another type of connector, such as an Anderson or Deans, on the other.

ON THE BENCH

I used the 959 exclusively for several weeks, and it worked reliably and quite well throughout all of my testing with a wide variety of battery packs. Using this charger is very simple. The instructions are brief yet effective.

Begin by powering up the charger either with AC or DC current. Initially, the LCD screen will show zero voltage. Next, attach the battery and note that the LCD screen shows the battery voltage before it begins to charge. The charger default current level is 3 amps; if you wish to select one of the other six charge-current levels, first press "Display" until you see 3 amps. Then press "Select" until the current you want appears on the LCD screen. At that point, press "Start," and a red LED next to the start button will flash. For about 30 to 60 seconds, the charger goes through a self-diagnostic period, during which it will not accept any other commands. After this, the LED will glow a steady red, and charging will begin. You will note that the display always reverts to the voltage under charge. This will show you when voltage peaks. If you want other information from the LCD screen while the 959 is charging, just press "Display." The unit will cycle from voltage to current, to charge time, delta-peak-threshold voltage and then back again. In every display item, the battery-status icon appears in the upper left-hand corner of the LCD screen. This icon appears clear when the battery pack is fully discharged. As the charge builds up in the pack, the icon becomes shaded (black). When the icon is fully shaded, the battery is fully charged—a neat and simple indicator!

Top: the 959 has adjusted to its 100mA trickle-charge rate. Bottom: the screen indicates that the pack has reached its peak of 9.95 volts.

When the peak voltage is reached, the 959 cuts itself off and beeps three times. The charger automatically adjusts to a 100mA trickle rate and will remain at that level for 50 minutes, after which the charger turns itself off. During trickle charge, the red LED will blink quickly, and the LCD screen will hold the peak voltage attained at the point of cutoff. This is a good reference point if you keep records on each battery pack. Keep in mind that the display always reverts to the voltage reading. When you select another item, such as charge current, that display stays on for only a few seconds and then returns to "voltage." Also, if you select a charge current other than the 3A default setting, the 959 will stay at that level as long as the charger is hooked up to a power source. When the charger is unplugged, it resets to the 3A current level.

FINAL ANALYSIS

I found the 959 very accurate and repeatable in all of my tests. You must remember that this is not an automatic current-setting charger; you need to set the current level for your particular batteries' rated capacity. On the one hand, if you set the current too low, it will take much longer to reach full charge. On the other hand, if you set it too high, you might damage the battery. Generally speaking, I use the figure of three times the rated capacity for Ni-Cd batteries. If the battery is rated at 1,000mAh (1 amp/hour), I set the charger to 3 amp (3x"C"). If the battery was fully depleted, it would take approximately 20 minutes to reach full charge. For NiMH batteries, I use a more conservative two times the rated battery capacity. So for a 500mAh (0.5 amp/hour) pack, I would set the charger to 1 amp (2x"C"). In that instance, it would take approximately 30 minutes to reach full charge. I made up the chart, "Selecting Charge Current," to help with this. By the way, the 959 is strictly a charger; it does not have any discharge capability.

The 959 gets quite hot during the charging operation. There is no active fan, so cooling is strictly by natural convection. The instructions tell you that after three or four consecutive charges, you should unplug the charger and let it cool down. You aren't likely to charge that many battery packs back to back, so this shouldn't be a problem.

The MRC Super Brain 959 is a very reliable charger that worked perfectly time and time again during my testing. It handles Ni-Cd and NiMH equally well, and its selectable voltage-peak threshold is a nice feature. Best of all, it's very affordable. ✈

MRC (Model Rectifier Corp.)
(732) 225-2100; modelrectifier.com.

Cable control and travel trailers

Judging by the amount of mail that I've been sent, one of the most popular topics covered in "Thinking Big" was how to install steel-cable pull/pull control systems. The letters and email continue to come in, and several readers have asked to see more installation details. To show my latest control setup, I took several photos of my uncovered, ⅓-scale Pietenpol Aircamper. You can clearly see the elevator-control tiller arm that was illustrated in the February 2002 issue. Also shown are the Du-Bro ¼-scale turnbuckles I used to connect the cables to the control horns. Combined with Robart Mfg.'s bolt-on metal clevises, the installation is uncomplicated and results in a taut, slop-free control system. The way I see it, if turnbuckles and cables were good enough for full-size aircraft of the '20s, '30s and '40s, then they are good enough for my giant-scale airplanes.

I like to use cable control because the system has both scale appearance and operation, and cables save weight. By eliminating large-diameter pushrods in my Aircamper's rudder and elevator control, I estimate the weight savings to be about ½ pound. Since the model has a fairly short nose moment, 8 ounces of tail weight is not going to be missed in the least!

Most of my control-cable setups are in "straight run" configurations, and I avoid using pulleys whenever possible. I also try to minimize the use of fairleads to guide the cables to the control horn. This is my personal preference; to keep the control system simple and straightforward, I choose not to use them. Sometimes, when a structural member gets in the way of the cable, using fairleads is a necessary evil; I'll cover their uses in an upcoming issue. Until then, check out the photos to see how it's done.

Left: here is my Pietenpol Aircamper's rudder horn and pull/pull cable control installation. Note that the metal control horn is bolted to a hardwood rudder rib. The long attachment bolts connecting the clevises to the horn are temporary and will be replaced with shorter ones when the model has been covered and painted.

Right: this overview shows the rudder and the elevator control horns and cable installations. Note that the horizontal stab is bolted to the fuselage with scale metal attachment brackets and hex-head bolts, just as it is on the full-size aircraft.

Above: the heart of the elevator-control system is this tiller arm. A 4-40 steel pushrod and heavy-duty ball link connect the tiller arm to the servo, and twin cables are attached to each side of the tiller to connect the two elevator halves. The pivot rod is ⅛-inch music wire that rides within brass tube bearings. The whole assembly is supported by two plywood webs that are glued to the fuselage structure.

Above left: I also like using these new Du-Bro heavy-duty molded-plastic clevises to attach cables to metal control arms and tiller arms. Above right: to connect my pull/pull cables to the control horns, I used a combination of a 4-40 Robart bolt-on clevis and a ¼-scale Du-Bro turnbuckle. The clevis at the bottom shows a simple cable attachment setup without using a turnbuckle.

STRONG CONTROL HORNS

An important factor in minimizing control slop is to install strong, rigid control horns. The most powerful servos and stiffest pushrods won't help control response at all if you have a flimsy control horn. For my sport models, I have been very pleased with threaded-rod control horns. They are very easy to install (just drill a hole), and the threaded body allows very fine adjustments to control throw. These control horns are a great choice when used with pull/pull cables.

Sullivan Products recently introduced some new giant-scale, threaded-rod control horns that I think are really well made. The Super Horn comes with a 2½-inch-long, 8-32 countersunk bolt, a red-anodized base nut and a ¾-inch-long, black, nylon-filled plastic standoff horn that screws onto the bolt. It also comes with a 4-40 threaded metal clevis and safety clip and a short length of 4-40 threaded rod. The new Super Rudder Horn has a 5-inch-long, stainless-steel 8-32 threaded rod, two base nuts, two offset horns and two 4-40 clevises, safety clips and threaded rods.

To properly install the new control horns, you must install a hard point in your control surface. The instructions recom-

Sullivan Products' new Super Horn and Super Rudder Horn are strong and easy to use. Both use an 8-32 bolt for rigidity.

mend a short length of ½-inch dowel glued into place and sanded flush with the sides of your control surfaces. If you've used Sullivan products before, then you know that these reasonably priced control horns will do the trick for your largest aerobatic and sport flyers.

TRAILER TRAVEL

Another topic that's popular among readers is the use of travel trailers to transport large models to the flying field and out-of-town events. We all start out with models that are just big enough to qualify as giant scale (80-inch span) because we know they'll fit inside our cars. Our automobile's cargo capacity seems to be a big factor in choosing the size of airplane we build. A short trip to the local flying field without a passenger onboard is doable, but when you add family members and extra gear for a trip out of town, things start to fall apart. For years, my wife and I traveled to Kingston, Ontario, Canada for the annual Father's Day Fun Fly weekend. We'd pack everything up, and off we'd go. This worked fine until our daughter showed up; then, the old Isuzu Trooper started getting cramped. After only a couple of trips, we were convinced that we needed a trailer. But which one, and what size? Here are some things to consider.

Perhaps the best field accessory I ever bought since I began flying giant-scale models is my 6x10-foot utility trailer from Pace American.

When choosing a trailer to haul your RC gear, you have to figure how much equipment and how many models you want to carry. For me, a single-axle, 6x10-foot trailer was the answer. This size is ideal for carrying from four to six giant-scale models as well as all my field equipment, chairs, tables and a 10x10-foot shade tent. Other modelers tow smaller (5x8-foot) trailers, but I'm happy with my 6x10 Pace American! I wholeheartedly recommend that you buy one with an optional side door; it makes loading and inspecting your cargo so much easier, and it's a big timesaver, too.

Several good brands are available, and you can find local dealers in the telephone book or by searching online. Some popular brands are Pace American, Wells Cargo, U.S. Cargo and H&H Trailers. All these companies offer single-axle, enclosed, utility-style trailers, and all are extremely well built.

I recommend that you get a trailer with an inner wall of plywood. This makes it much easier to install shelves and racks for your models, rather than having to work with metal frames and brackets.

Trailers come in many colors; they can even be ordered to match the color of your vehicle (although this costs more). I am told that white trailers are most popular because white reflects heat better than darker colors. No one wants their models to bake on a long trip, so it probably is best to stick with white.

STORAGE RACKS

I used 1x4-inch pine boards and thin lauan plywood to build the storage cabinet and racks in my trailer. Depending on the types of models you have, you can custom-make your racks to fit your needs.

Above left: for storing frequently used supplies and equipment, I installed this plywood cabinet in the very front of the trailer. It holds a lot of stuff! Above right: as you can see, my wooden rack system is simple and can support several models. It is easily adjusted or removed to make room for various models.

Since I fly different types and sizes of models all the time, I built racks that slide in and out. I can arrange them to suit my specific needs, and I can slide two racks together to form one large platform if I have to. I installed a simple overhead rack to carry wings, and I also put in a pair of centrally mounted tracks attached to the center of each side wall to support the racks. Two or three planes can be supported on the main rack, and at least two more models can be secured to the floor and stowed

TRAILERS ON THE GO

Once you start going to regional and national events, a trailer becomes a must-have for sane traveling. Though some might see a utility trailer as a big expense, it pays for itself by making road trips easier and less time-consuming. No more hangar rash from jamming your model into the family car; just hitch up the trailer, and you're ready to go! Here are the addresses of some trailer manufacturers.

Pace American, 2290 McGuffey Rd., McGregor, TX 76657; (800) 247-5767; paceamerican.com.

Wells Cargo, 1503 W. McNaughton, Elkhart, IN 46514-2243; (800) 348-7553; wellscargo.com.

U.S. Cargo, 17645 Commerce Dr., Bristol, IN 46507; (219) 848-1335; forestriverinc.com/uscargo.

H&H Trailer Co., Hwy. 71, Box 114, Braddyville, Iowa, 51631; (712) 589-3100; hhtrailer.com.

under the rack. When everything is made of wood, it's easy to screw in hooks and eyebolts wherever they're needed to secure the models. The rails go from the very back of the trailer walls forward to just short of the side door. This leaves a space in front to stow camping gear and other supplies. Just in front of the side door, I built a storage cabinet to house all the supplies that "live" in the trailer full time. Items such as folding chairs, blankets, paper towels and tools for the trailer itself (tire-changing stuff) stay in easy reach and are never forgotten.

POWER PANEL

To make things a bit easier to deal with, I also installed an electrical power panel inside the trailer and attached a weatherproof box on the outside. Whenever I stay at a motel, I can run an extension cord to the trailer and keep all my airplanes on an overnight charge! This is really easy to do, and all the parts are available for less than $30 at an electrical supply store. This is also a handy feature to have if you want to use a small, portable generator. You can easily hook things up and even have a shop on wheels if you like to use power tools and lighting. If you don't feel comfortable installing electrical equipment yourself, you can always have a professional do it for you.

This power strip allows me to charge my model's batteries without taking them out of the trailer. I just run an electrical extension cord from my motel, plug it into the trailer, and I'm in business.

Yes, I know; it all sounds so extravagant, but you don't have to spend a lot of money. Like anything else, you have to shop around for the best deals. I was lucky enough to find a dealer who had just received a new shipment of trailers and was really interested in getting rid of his old stock. On top of that, he had a demo trailer he used to bring to trade shows. I purchased a year-old demo equipped with a side door and the complete trailer-hitch frame for less than $2,300 installed. After four years of regular use (I also transport my daughter's go-kart and my motorcycle in it), the trailer has never let me down. On a long trip out of town, the additional elbow room in our Trooper is priceless!

The next time you attend a giant-scale fly in, check out some of the trailers in the parking area. You may decide that this is the next logical step in enjoying our great hobby! Until next time, have fun and fly safe.

Du-Bro Products *(800) 848-9411; dubro.com.*
Robart Mfg. *(630) 584-7616; robart.com.*
Sullivan Products *(410) 732-3500; sullivanproducts.com.*

Hitec RCD Digital Servo Programmer HFP-10

by David C. Baron

Unleash your digital servo's full potential!

Hitec's digital servos became available just a few years ago, and their increased torque and holding power set the stage for more precise control than we had ever had before. The new HFP-10 from Hitec RCD is much more than just a servo programmer: it is a total RC system tester and has many great features that go beyond what we would consider normal servo adjustments. Though designed specifically to program Hitec digital servos, the unit can also check practically any brand of radio gear and analog servo.

Although all of this wasn't completely clear to me at first, after using the HFP-10, I am totally excited about its many great functions.

DUAL SERVO CONTROL

Elevators and flaps are my two favorite places to use dual digital servos, and the HFP-10 is an invaluable device for anyone who wants to use a Y-harness to connect two servos this way. It's here that the unit seems most useful; it cures all of the problems that occur when you use a Y-harness.

To use dual elevators, simply install a handy Y-harness, and then plan your pushrod installation. If, however, you use two servos that have the same rotation direction, the installation becomes more complicated than just mounting the servos on either side of the fuselage under the stabilizer. To make each elevator half move in the same direction, one pushrod must be connected to the servo's 12 o'clock position, while the other pushrod must be connected to the other servo at the 6 o'clock position. This means that the two pushrods have different mechanical advantages, and the two elevator halves will move at different deflection angles. With the Hitec servo programmer, you can simply reverse the direction of one of the servos (making both pushrod layouts the same), and then you can match the servos' center points and throws. All that's left to do is to go fly with new precision.

BUT WHAT ELSE CAN IT DO?

Plenty! Using the programmer, you can also reset the servo to its factory default settings, change the servo direction and adjust the servo's rotation speed. You can set the servo neutral (center) point, and you can set the fail-safe position. You can also measure the pulse width sent from the transmitter to the receiver and the servo, and you can measure the receiver voltage sent to the servo. The unit also has an automatic servo-movement test program.

The unit's input/output plug receptacles are clearly labeled.

PROGRAMMING FUNCTION APPLICATIONS

These in-the-servo features are great if your transmitter doesn't have them.

• **Reset to factory default.** This is most commonly used after trying to adjust something and then messing it all up. Always have the servo disconnected from any pushrods (loads). This should be done before programming any Hitec digital servo. During this function, the servo will move to both of its travel direction extremes prior to showing "success" in the display.

• **Deadband width.** This is the function you need to use if you are "ganging" servos (using more than one) for a common control surface. It allows you to "slave" the servos for a common task, without having them fight each other over the neutral position and drain the airborne battery. Adjustment is available from 3 microseconds to 48 microseconds. Use the smallest value that will allow the servos to operate without fighting.

• **Reversing direction.** Digital servos can't be changed in the old-fashioned way (by reversing the motors and pot wiring); you have to do it with the programmer. By reversing one servo, you can make identical pushrods and servo mounts and use a dual-servo, split-control surface that has equal throw. Other applications in which a mirror-image drive is desirable are flaps, ailerons, spoilers, retracts and twin-engine throttle linkages.

• **Servo speed.** Today's digital servos are so fast that situations can exist in which they need to be slowed down. I have used this function on flaps to duplicate scale deployment speeds. There are 16 proportional steps to choose from. The servo's default position is always the fastest setting.

SPECIFICATIONS

MANUFACTURER: Hitec RCD

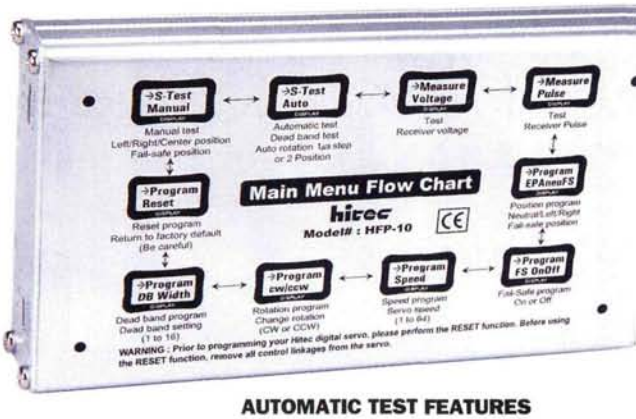
PRODUCT: HFP-10 Digital Servo Programmer

ITEM NUMBER: 44410

DIMENSIONS: 5.5x3.125x0.875 in.

PRICE: $259.95

FEATURES: the HPF-10 Digital Servo Programmer comes in an aluminum case and has an LED display, a main power switch, an adjustable knob and input buttons. The programming menu is printed on the unit's back panel, and there are two input/output plug receptacles. The unit's program menu includes screen displays for manual-servo test and auto-deadband test, receiver-voltage test, receiver-pulse test, program position/fail-safe position, fail-safe on/off, servo-speed select, servo-direction select, deadband-width setting and a factory-default reset.



A handy feature is that the HFP-10's menu flow chart is printed on the back panel. No more losing the instructions!

• **Fail-safe.** I find this feature amazing! It is built into the servo, and applications for it are everywhere; the most obvious one is to retard the throttle if the transmitter's signal is lost. At the same time, you can also throw in a bit of rudder to prevent the model from flying away! The rest of the servos can return to neutral in case a failing battery or signal loss has left them off-center.

• **Endpoint/neutral point/fail-safe adjustment.** You can also custom-tune the servo for a specific installation. Fine servo-centering-position adjustments are critical when you set up mirror-image installations. In this sub-routine, you can also modify endpoint travel. These adjustments allow you to establish identical neutral points to guarantee identical control throws in multiple servo installations.

PULSE WIDTH

The unit also allows you to measure the transmitter's pulse width sent to the receiver and the servo. This is remarkable because some manufacturers compress the standard pulse width, and that robs the servo of full travel. Other transmitters can have it set too high, and this may cause a servo to go beyond its endpoint limits and stall—a disaster to battery current. Knowing what the pulse width is also comes in handy when dealing with devices other than servos. Speed controllers, glow-ignition switches and smoke systems, just to name a few, need the proper bandwidth to operate properly. If you don't know what the bandwidth is, how can you be sure that your speed control is really giving you full power? Without testing it, you may never be sure!

The HFP-10 can also measure the voltage sent from the receiver to the servo. This is great, especially when you want to test the loads on control surfaces or when using very long servo leads. If you run a lot of servos in parallel, you need to be sure that the voltage drain across the system doesn't drop below its minimum power requirements. When I look for binding pushrods or any other reason why my servos are drawing too much current, I use an amp meter coupled with the servo tester.

AUTOMATIC TEST FEATURES

The automatic servo-movement test program moves your servo to each of its extreme travel limits. This is especially useful after you've taken a servo apart. You can be sure that the midpoint is set correctly. I use the manual servo-movement test every time I install a servo in a new installation. Under a light servo load, it helps me find any dead spots in the servo throw, damaged gears, or a lack of speed or power. There's so much you can do with the HFP-10 that you'll soon wonder how you ever got along without it.

Fine-tuning servo installations and measuring your transmitter's output has never been simpler. With this new device, we can now unleash the full potential of our digital servos!

Hitec RCD (858) 748-6948; hitecrcd.com.

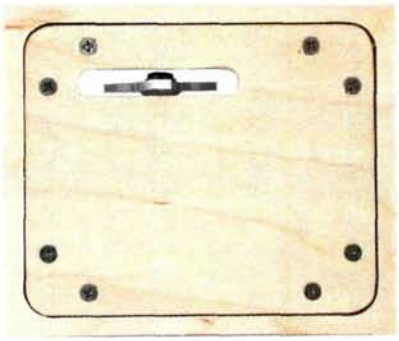
AT *MODEL AIRPLANE NEWS*, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

J&B Access Panels

Removable Hatches

A flush fit

Just like their full-size cousins, model airplanes benefit greatly from access panels and removable hatches. If you have ever built a model airplane with dual aileron servos in its wing, then you know access hatches are a good thing. Sure, you could simply cut a hole in the wing panel and install the servo so it sticks out into the air stream, but nothing beats a flush-fitting, recessed hatch panel for a smooth, professional-looking installation. This isn't exactly a quick and easy thing to do, however. You must first figure out the size and shape of your hatch, and then install hardwood rails and a recessed lip to support the removable plywood panel. You have to drill and countersink the attachment screw holes and then attach the servo to the underside of the panel. You also have to cut a neat slot in the panel for the servo arm to pass through. I can't make a really good fitting, servo mount and hatch installation in less than two or three hours.



The clever folks at J&B Access Panels have made it easy for you to have professional hatches in just a fraction of the time it would take to make them yourself. No more cutting and fitting; you just choose the size and shape of panel you want, install your servo, and glue the whole installation into place in a matter of minutes! Once the parts are in place, you simply complete the wing structure, and your wing is ready to finish.

Available in several shapes and sizes, these access panel assemblies are machined from plywood and come in two pieces: the base and removable panel. The base is machined with an end mill to form a precise opening that fits the panel perfectly. The base is about ¼ inch thick, and the panel opening is ⅛ inch deep and forms a wide lip around the opening to support the panel. The servo-mounting blocks are formed when the base is machined; you must remove the excess wood when you cut the base open.

The panel comes with the mounting screw holes already drilled and countersunk. With the small servo-access panel shown in this review, two servo-arm slots have been cut partway through the panel.

You can make mirror-image hatches for your left and right wing panels. The countersunk panel-mounting screws are also included with the unit.

It took me about 15 minutes to cut the parts free of the base and to install my aileron servo on the removable panel. If you cover your model with film, you can leave the panel as it is because the film will cover the unused slot. Because I wanted to paint my panel, I flipped it over and glued the servo-mounting blocks on the same side of the panel as the countersunk screw holes were. I simply countersunk the holes on the reverse side and installed the panel with only one slot showing. Quick and easy!

If you want professional-looking, flush-fitting access panels but don't want to spend a lot of time at the workbench, J&B Access Panels are for you. Priced from $5 to $7 each, they are available as large and small servo panels, an upright servo panel, two fuel-tank access panels and a wedge-shaped tail-hatch panel. Once you try them, I doubt that you'll ever want to build your own again. Try it; you'll like it!

—Gerry Yarrish

J&B Access Panels
(270) 651-9166;
jbaccesspanels.com.

Plastech

All-Purpose Plastic Repair Kit

Repairs in minutes

Have you ever whacked your plastic cowl and cracked it? I know I have. Most plastic and fiberglass repairs are time-consuming and messy, and they yield less than satisfactory results. Plastech is a new way to repair just about any type of hard plastic and fiberglass quickly and easily. The repair kit consists of a container of acrylic resin powder, a bottle of catalyst, an application needle and a reusable molding bar. The molding bar allows you to duplicate small parts or cast your own.

I had a cracked ABS cowl that was a perfect test for the repair kit. For maximum bonding strength, I first V-grooved the crack to expose more surface area. The resin powder can be applied in two ways. First is the needle method. Lightly squeeze the applicator, and place a drop or two of the catalyst onto the resin powder. Quickly pick up the resin with the needle on the applicator and position it above the repair area. Now lightly squeeze the applicator to drop the resin onto the repair area.

I found the second way easier; I rubbed the resin into the crack and then applied a few drops of the catalyst directly on the powder.

After the resin had cured (about 15 minutes), the repair was stronger than the parent material, and I could flex the repair area without its cracking. It's really tough! Plastech can be used to repair ABS, acrylic, fiberglass, metal, wood, balsa and plywood; plus, it can be sanded and painted.

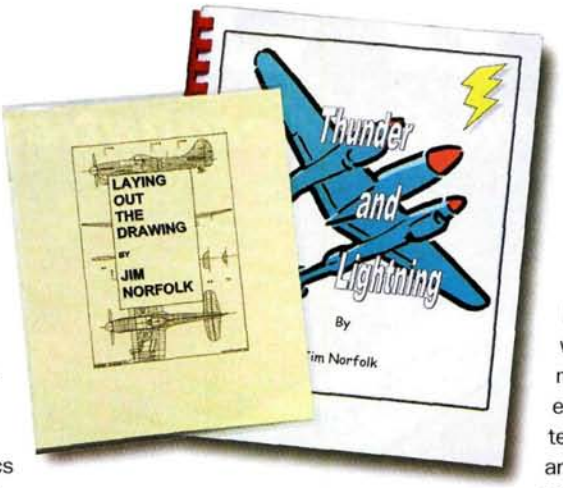
If you're looking for an easy way to repair plastic or other materials, Plastech is just the ticket; at $10, it's a bargain. —*Rick Bell*

Plastech Formula Ltd. (619) 660-2540; plastech-formula.com.

Quality Mgt. Intl. Ltd.

"Laying Out the Drawing" & "Thunder and Lightning"

New books for scale enthusiasts



After nearly 50 years of modeling, Jim Norfolk has developed quite a few tricks and techniques for designing and building models. Fortunately for the rest of us, he is eager to share what he has learned. Creating a plan from scratch is often a major stumbling block for modelers who want to scratch-build an original design. "Laying Out the Drawing" is a wonderful guide to help the budding designer develop a feel for the techniques and mechanics of drafting a suitable plan for his dream project. Norfolk leads us step by step from original source material (another plan, a 3-view, or photographs) to a finished design. Deciding on a suitable scale, determining a rough layout, working out the structure and refining the plan are all covered clearly and concisely. He also extensively covers drafting by hand and computer, and he discusses the advantages and disadvantages of each method. Norfolk thoughtfully includes a centerfold sample plan for a Curtis P-40Q-2 as a 19-inch, rubber, free-flight model. Most RC modelers with a few projects under their belts could easily enlarge and rework this plan to a suitable size and structure for a light park flyer or a larger, heavier, sport-scale model.

In "Thunder and Lightning," Norfolk presents a series of designs for the P-47 Thunderbolt, Macchi 202 Foglore (Thunderbolt), Mitsubishi J2M (Thunderbolt), P-38 Lightning, Kawanishi N1J Shiden (Violet Lightning) and British Electric Lightning. In addition to the expected workup of building, covering and flying the models, Norfolk presents an historical brief of each prototype. He also discusses designing techniques, scaling the designs to other sizes and selecting wood for scratch-building models of these planes. The included plans are drawn for free-flight models, but it would be simple to enlarge and adapt them to electric or glow power.

Norfolk's experience and capabilities are readily apparent when you read these books. I am glad to have found them and to have benefited from some of his insights into modeling. "Laying Out the Drawing" costs $7.50; "Thunder and Lightning" sells for $22.50 (plus shipping).

—Thayer Syme

Quality Mgt. Intl. Ltd. (506) 633-2060; qmilj.tripod.ca/index-2.html.

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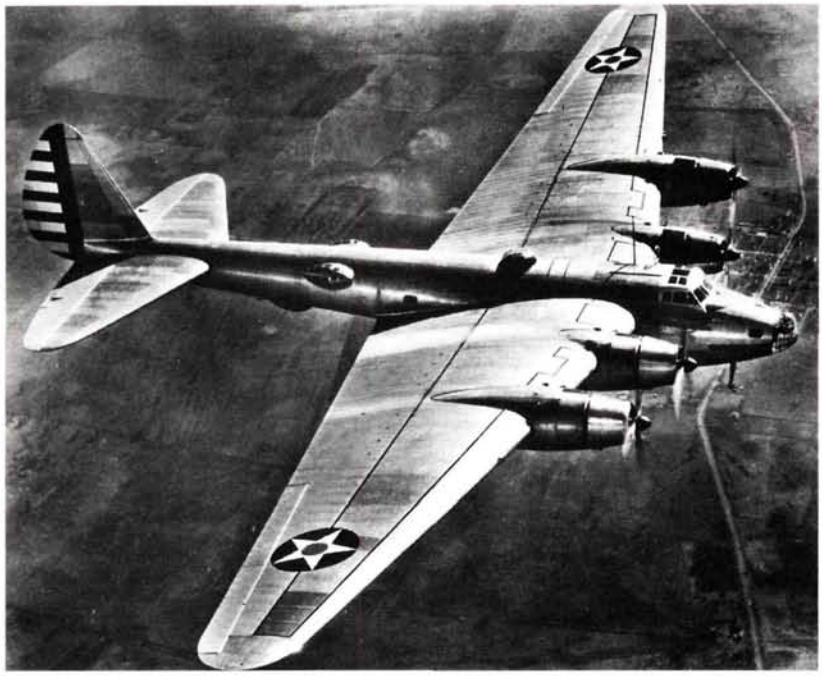

Congratulations to Allen Sherman of Pembroke, MA for correctly identifying June's mystery plane as the Spartan Executive. Probably the most notable plane produced by Spartan Aircraft Ltd., the Executive was a four- to five-seat cabin monoplane. It was produced primarily for the civil market, but in 1942, 16 Executives were pressed into military service under the designation UC-71 to function as staff transport planes. The Executive featured retractable landing gear and was powered by a 400hp Pratt & Whitney R-985 Wasp Junior engine. From the Executive, Spartan also produced a two-seat military plane called Zeus, some of which were exported to Mexico and China.

The winner will be chosen, four weeks following publication, from correct answers received (delivered by U.S. mail) and will be awarded a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will be given a free, one-year subscription extension.

MODEL AIRPLANE NEWS

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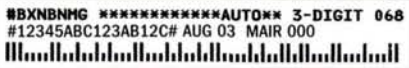

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BY JAIME LAGOR

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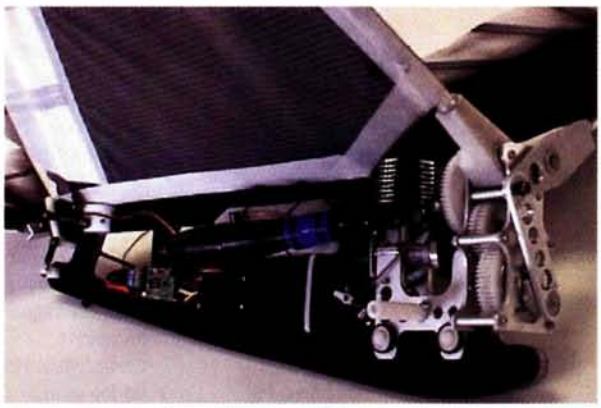
RC ornithopter saves lives

The concept of a mechanical raptor capable of bird-like flight is certainly not a new one; Leonardo da Vinci envisioned such a machine 500 years ago. It just may be an idea, however, whose time has finally come. Modern technology has enabled the development of extremely realistic, radio-control ornithopters, the applications of which extend far beyond the confines of the hobby industry. These high-tech marvels are actually saving lives.

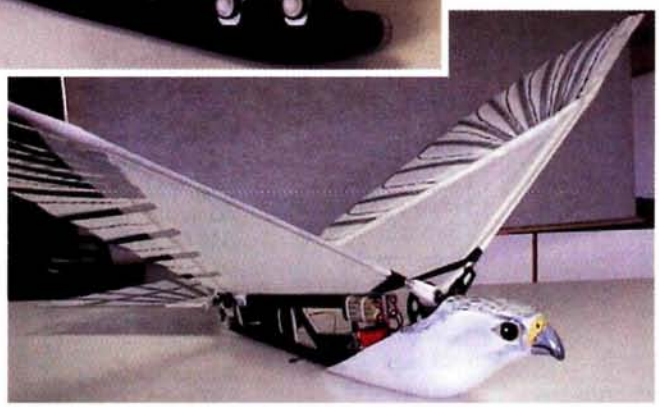
Here, Bruce Barnes of Intercept Technologies hand-launches a Robofalcon. The body is constructed entirely of fiberglass. Future versions may be produced using Kevlar and, eventually, a combination of Lexan and Kevlar.

For more than 20 years, Intercept Technologies Inc. of Ontario, Canada, has been developing wildlife hazard management plans for airports, golf courses, landfills and other facilities that are susceptible to large bird populations. The Robofalcon, a radio-controlled mechanical raptor, is the latest weapon being used in the fight to control wildlife populations and the hazards associated with their inhabitance of particular areas.

The Robofalcon is incredibly accurate in appearance and in flight capabilities. It not only features flapping wings, but thanks to a special mechanism adapted from RC boats, its wings can also be locked, thereby enabling it to soar, swoop and dive. It can fly even faster than a real falcon and has proven to be more effective than the real thing in driving off birds. Most important, the Robofalcon can go as high and as far as the operator desires. Robofalcons range in wingspans from 3 to 9 feet and are produced in several species, including a peregrine falcon and a golden eagle. They also come in both nitro and electric versions and can stay aloft for up to 20 minutes, depending on their size.

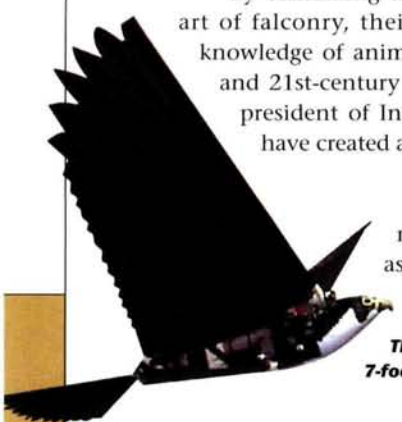


Here's a close-up look at the gear that produce the flapping motion of the wings. It is this flapping that provides the lift and thrust necessary for flight. The Robofalcon pictured here is nitro powered.



This replica of a white gyrfalcon is powered by a brushless motor and an 8- to 10-cell battery.

By combining the medieval art of falconry, their extensive knowledge of animal behavior and 21st-century flight technology, Wilfred Emonts, president of Intercept Technologies, and his team have created a practical and innovative solution to wildlife control while balancing the intricate needs of the environment. And though the problems associated with massive bird populations at golf courses equate to little more than a public nuisance, they are a matter of life and death at many of the world's airports.



This nitro-powered peregrine falcon has a 7-foot wingspan and uses an O.S. 1hp engine.

Since 1912, aircraft collisions with birds and other wildlife have killed more than 400 people and destroyed 420 aircraft around the world. Just seven years ago in Alaska, 24 people died when an Air Force surveillance jet crashed after geese flew into its engines.

Though wildlife-related aviation fatalities are not the norm, there is still a price to be paid every time a bird and an aircraft collide; try an average of $500 million in damages every year. Because collisions commonly occur during take-offs and landings, airport managers are continuously searching for new and more effective methods of clearing their property of the geese, gulls, hawks, vultures and owls that find the fenced-in grasslands and ponds such attractive breeding and feeding grounds. Lately, many airport managers are turning to Intercept Technologies and its Robofalcon for answers.

The Robofalcon's abilities to realistically simulate a bird's flight technique, to stay aloft for long periods of time and to travel great distances make it an ideal wildlife-control tool; in fact, this mechanical predator just may be the most effective method ever developed.

Robofalcons are strictly marketed to facilities whose operations would benefit from wildlife control, and they are available only as part of a complete management plan developed by Intercept Technologies, but they are also wonderful examples of how RC technology continues to positively impact so many segments of our society.